MODERN Machine Shop

A Magazine for Machine Shop Executives
HOWARD CAMPBELL, Editor

Vol. 4 NOVEMBER, 1931 No. 6

CONTENTS

	Page
LOCOMOTIVE TIRE WORK — *By John Henry Fisher*	9
SIMPLICITY AND ACCURACY ARE FEATURES OF THIS INVENTORY SYSTEM — *By J. J. Berliner*	20
WELDING WITH ATOMIC HYDROGEN — *By J. F. Springer*	30
THE CARE OF LEATHER BELTING — *By W. F. Schaphorst*	38
IDEAS FROM READERS	45
—GROOVING 1/8-IN. WIRE, *By Charles Kugler.*	
—BALL-TURNING DEVICE FOR THE LATHE, *By Lewis H. Williams.*	
—PORTABLE PNEUMATIC PUNCH AND SHEAR FOR RAILWAY SHOP USE, *By H. H. Henson.*	
—BENCH WRENCH HOLDER, *By Gilson Willets.*	
—AN EASILY-MADE CRANE FOR THE SMALL SHOP, *By Morris A. Hall.*	
—A BETTER TOOLMAKER'S JACK, *By Chas. H. Willey.*	
"OVER THE EDITOR'S DESK"	52
NEW SHOP EQUIPMENT	56
FOR YOUR CATALOG LIBRARY	74
"THE SCRAP PILE"	80
INDEX TO ADVERTISEMENTS	82

Published Monthly at 128 Opera Place, Cincinnati, Ohio.
DON G. GARDNER, President and General Manager

GEORGE H. MEYERS, *Western Manager*, Chicago
RAY GROBECK, *National Advertising Manager*, Cincinnati
H. I. CIRCLE, *Eastern Manager*, New York

(*Copyright 1931 by Gardner Publications, Inc.*)

ARMSTRONG TOOL HOLDERS are used in over 96% of the Machine Shops and Tool Rooms

"We use ARMSTRONG Tools wherever possible"

—H. W. Voss, Secretary, Monighan Manufacturing Co., Chicago.

"WE are pleased to advise that in our shop we use ARMSTRONG Tools wherever possible and consider them the best we are able to procure. We use ARMSTRONG Tool Holders, Lathe Dogs, and Wrenches of all kinds."

There is built-in quality, an excellence of design, material and workmanship that characterizes ARMSTRONG products. It has always been a policy of this company to make no "seconds" or inferior grades of tools. All the resources, the selection of all equipment, and the training of all workmen are directed to one end, the manufacture of highest quality tools. Each ARMSTRONG product is rigidly inspected, must qualify as an ARMSTRONG Tool or be destroyed. You can always depend on the ARMSTRONG name when accompanied by the Arm-and-Hammer Trade Mark. It is a certain guarantee of complete satisfaction.

Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG Spring Threading Tool "Gooseneck" gives resiliency that assures a smooth thread in even the toughest alloy steels.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
328 N. Francisco Ave. Chicago, U. S. A.
London Branch:
ARMSTRONG BROS. TOOL CO., Ltd.
35 Upper Thames Street, LONDON, E. C. 4, England

ARMSTRONG

Tool Holders
Lathe Dogs
"C" Clamps
Ratchet Drills
High Speed Steel Bits
Drop Forged Wrenches

ARMSTRONG BROS.

Solid Dies and Stocks
Adjustable Dies and Stocks
Pipe Cutters
Pipe Vises
Pipe Wrenches

Write for Catalog B-27. Shows, describes and prices all ARMSTRONG Tools.

ARMSTRONG

MODERN Machine Shop

NOVEMBER, 1931

CINCINNATI, OHIO VOL. 4, NO. 6

Locomotive Tire Work

A Description of the Tools and Methods Used in Handling Locomotive Tires in a Modern Railway Shop

By JOHN HENRY FISHER

ALTHOUGH many phases of locomotive work are highly specialized, the methods used in erecting and repairing locomotives may apply in general to other heavy machinery, and should be of interest to mechanics in general. Thus the shrinkage allowances and other standard practices in machining and applying locomotive tires are of interest to all railway mechanics even though they are engaged on other work, and the methods used in large locomotive shops are of special interest to those familiar with small shop methods only.

The machining of a locomotive tire is a comparatively simple operation, still, a number of fixtures have been developed for this work that are worthy of study. The tires come from the rolling mill rough bored and finish turned, leaving the bore to be finished. The bore must be true with the faced side of the tire, therefore the face must be checked with a surface gage after the tire is clamped down. In clamping the tire to the boring mill table, the clamp shown in Fig. 1 will be found an improvement over the ordinary "U" clamp and bolt. The angle irons shown in Fig. 2 will be found of assistance when several tires of the same diameter are to be bored. Blocking is inserted between the table and tire directly under the jaws of the four hold-down fixtures.

An allowance of 1/64 in. to each 12 inches of diameter is standard for the shrinkage of tires. The standard adopted by the Master Mechanics' Association in 1907 was 1/80 in. per ft. of tire diameter for tires under 66 inches, and 1/60 in. per ft. for tires larger than 66 inches inside diameter. However, as there are now but few locomotives with tires more than 66 inches in diameter, the standard allowance of 1/64 in. to the foot may be used for all tires.

Tires are sometimes bored straight through, but it is better practice to leave a retaining lip ⅛ in. high which sets up against the outside edge of the wheel center when the tire is set to the proper gage. Assuming that the outside of the wheel center rims are faced true and central with the hubs, the following method is used to determine the depth of bore of the tire: The distance between the faced out-

side edges of the two wheel rims is noted. From this dimension the standard gage of the tires is subtracted and the result divided by 2. The quotient is the required depth of bore.

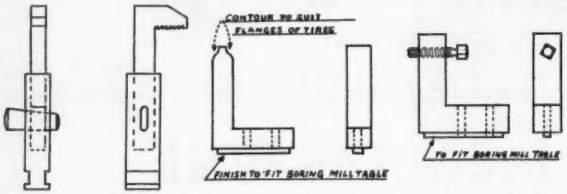


Fig. 1 (Left)—Improved clamp for clamping tires to boring mill table. Fig. 2 (Center and Right)—Angle iron supports and fixtures for holding tires.

The gage of the tires is the distance between the inside edges of the tires when mounted on the wheels. The retaining lip should not be more than ⅛ in. high, as it would interfere with shimming the tire from the outside, which is sometimes necessary. It should be noted that the gage of tires is not always the same, depending upon the length of the rigid wheel base of the engine.

Some years ago an ingenious "finger gage" (Fig. 3) was developed which, when applied to a worn flange, indicates the amount necessary to be turned off from the tread in restoring the flange to correct contour. The gage is graduated, so that the thickness of the tire can be measured. This gage is very useful on the wheel lathe, or in selecting second-hand tires for reclamation. The minimum thickness of flange allowed in use is 15/16 in.

The limit of turning or thickness of a tire depends on the weight of the drivers and the class of service for which the engine is used, and is different for different classes of engines. Thus, 2¼ inches may be the limit of turning for the tires of a heavy passenger engine, and 1¾ inches the limit for a freight engine. Fortunately, tires do not often break in service. If too great a shrinkage allowance is made, the metal in the tire is given a permanent "set" and the tire is apt to break, especially if it is one of the smaller sizes—56 inches or less, and the tire happens to be thin. A thick tire seldom breaks, and if put on too tight will give the metal in the spokes and wheel rim a permanent set. There is no advantage in allowing more shrinkage than standard. The writer once saw a case where it was necessary to do some cutting with an oxy-acetylene torch near a tire, heating it nearly red hot in one place. This set up a strain in the metal, and the tire later broke at this spot.

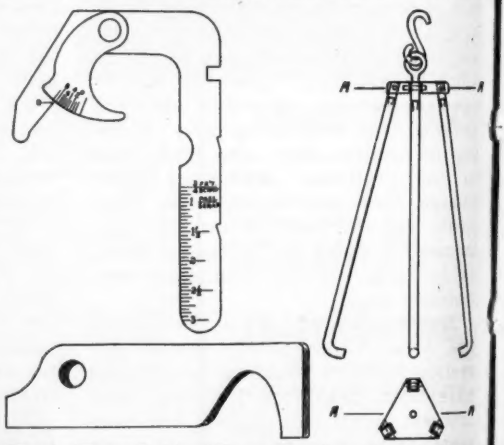


Fig. 3 (Upper Left)—"Finger Gage" graduated to show amount that must be turned off tread to restore flange to correct contour. Fig. 4 (Right)—Hooks for handling tires. Fig. 5 (Lower Left)—Standard tread gage.

The three-legged hooks shown in Fig. 4 are used for handling tires on

and off the boring mill table with the crane, and also for stacking and loading tires, and handling them into and out of the tire pit. The tire tongs shown in Fig. 6 are useful in stacking tires, or in pulling the top tire out

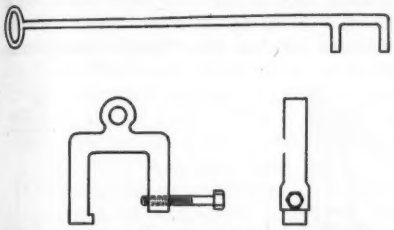


Fig. 6 (Above)—Tongs used in stacking tires.
Fig. 7 (Below)—Special "C" clamp for handling tires to wheels.

of the stack so that the lifting clamp shown in Fig. 7 may be applied. This clamp is designed to handle hot tires on to the wheel centers by the use of the crane, and also to place tires on the wheels so that they may be chained at the top of the wheel and heated with a portable tire heater. The illustrations are largely self-explanatory and no lengthy explanation of these tools or their use is required.

In the early days of railroading, before the use of fuel oil, setting a tire was a difficult task. A tin trough was placed around the wheel and filled with kindling wood. The wood was fired, and by the use of a blast of compressed air it was possible to loosen the tire. Fuel oil was presently introduced, and burners using compressed air and gasoline, kerosene, or distillate were used for setting tires. The common type of portable tire heater requires a tank capable of withstanding the full pressure of the shop air line, and a special valve which will allow air to pass into the tank and provide a means of regulating the air blast to the burner, also to regulate the gas supply. A reducing valve is also sometimes incorporated in this valve to lower the air pressure as required, but this is not essential. A ball check should be provided in the gas line (usually placed in the end of the pipe that reaches to near the bottom of the gas tank) as a safety device to prevent fire reaching the gas in case of an explosion. Such a tire heating tank with a suitable burner may be used for miscellaneous heating around the shop.

The tire burner is a piece of perforated pipe bent to fit the tire. One of the most successful types has a return bend, the first coil acting as a heater and the second coil having 3/32 inch holes spaced every three or four inches. A ½-in. pipe is a convenient size to use. This size will pass under brake shoes and sand pipes, and is flexible enough to be sprung over rods and other parts. It is possible to put

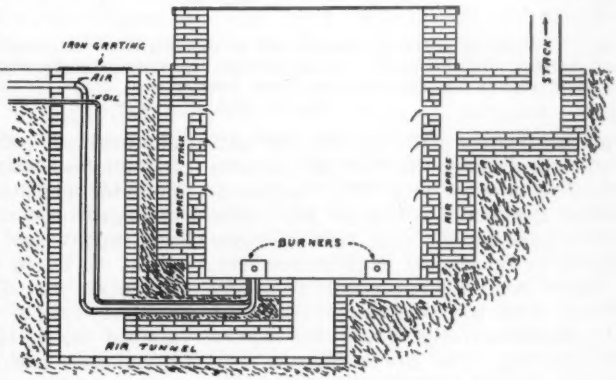


Fig. 8—Cross-section drawing showing design of tire pit.

such a burner on any tire for shimming or setting without stripping the engine.

Wherever the volume of work justifies it, however, a tire pit should be used to heat the tires.

The advantage of the tire pit or furnace is that the entire set of tires is heated at one time and those left in the furnace will stay hot for half an hour or more, so that the possible volume of work is greatly increased. With the aid of a tire pit and crane it is possible for two men to apply forty or more new tires in one day. This number of tires is more than any shop, with the possible exception of the Baldwin works, would ever require in one day. The tire furnace is such a time saver that it ought to be in every shop that has a crane, even though used only occasionally. The general construction of a tire furnace is shown in the sketch, Fig. 8. The diameter of the pit is several feet larger than the largest tire to be handled. The tires rest on three pieces of heavy I-beam placed in the pit in such a way as to accommodate different sizes of tires. The sides and bottom of the pit are heavily lined with fire brick, and it has several air ports connecting to an air space outside the lining, which connects to a stack extending through the shop roof. A sump in the center of the bottom of the pit, where sometimes unburned oil collects, connects to the surface by means of a tunnel, and provides additional air. The burner, arranged for crude oil—the most economical fuel—consists of a jet about ⅛ in. in diameter surrounded by an air jet. There should be three burners set to discharge obliquely against the wall of the furnace so that the flames and hot gasses have a spiral motion around the furnace between the wall and the tires. Such a furnace will heat tires in from 20 to 25 minutes. The tires are handled out with the three-legged hooks shown in Fig. 4, and then the clamp illustrated at Fig. 7 applied.

The standard gage of railroad track is 56½ in. All tires, however, are

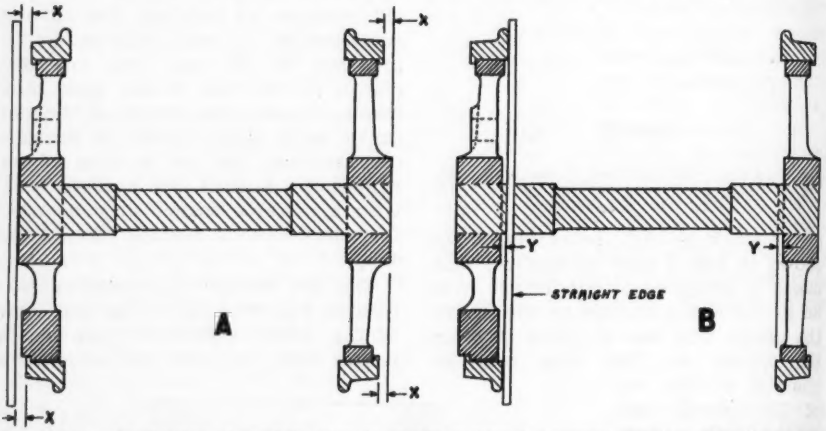


Fig. 9 (A)—Application of straight edge in checking tires for central position when boxes are on wheels. Dimension "X" should average the same on both wheels. (B) Application of straight edge in checking tires for central position when boxes are off. Dimension "Y" should be the same on both wheels.

not set to the same gage, for in rounding curves, the front and back tires tend to crowd the flanges. In the early days of railroading, when the engines were small, tires were considered in gage if not over 53½ in. apart or less than 53 in. apart. The present tolerance for the gage of tires is much less, and is often set at 1/32 in.; that is, tires that vary more than 1/32 in. from standard, either way, are considered out of gage. There is considerable variation in the standard gage on different engines and different wheels on the same engine. To give some idea of standard practice, the standard gage of the driver tires on an engine having only two pairs of drivers is 53⅜ in. On an engine having five pairs of drivers, the gage of the front, back and main tires is 53 in., and the gage of the two intermediate wheel tires is 53¼ in. The wheel base last considered would be unusually long, and it is desirable to have the front, back and middle tires set in so as to allow the engine to pass around the curves without cutting the flanges. In shrinking driver tires in place it will be found that most wheels dish in slightly after the tires tighten up, and for this reason, if tires are set 1/32 in. wide while hot, they will draw in to the correct position when cold. Sometimes the backs of tires are faced in the wheel lathe to bring them to correct gage and make them run perfectly true, but this practice is not usually considered necessary.

It is necessary to set tires central within 1/16 in. with the inside hub faces, to prevent one tire being crowded against the rail and cutting the flange. If the driving boxes are off the axle it is an easy matter to check this dimension by placing a straight edge across the back of each tire and measuring the drop from the straight edge to the hub face, as shown at **B** in Fig. 9. Should it be necessary to put on a pair of second-hand tires or tires without a properly-located retaining ring, the first tire may be located centrally by comparing the gage of the tire with the distance between the inside hub faces. Should the distance between the hub faces be somewhat greater than the gage of the tires, the difference should be measured and the first tire set should be set so that it overlaps the hub line by one-half this amount, as shown when the straight edge is placed across the inside edge of the tire, and a measurement made to the hub.

Should it be necessary to put on a set of tires without removing the driving boxes, they may be set to drop equally from a straight edge held against the **outside** hub faces. When an entire new set of tires is applied and the wheels pass through the wheel lathe for turning, the edges of the wheels are faced central by measuring in this manner from a straight edge held against the outside hub faces. Should one hub be thicker than the other, the thick hub is later faced in the journal lathe so that there is no error from hubs of different thicknesses. In facing the outside edges of wheels central it is not desirable to remove any more metal from the rim than necessary, so the cut should not be made too deep. Only enough metal should be removed to give the retaining ring sufficient clearance for inspection, so that it is possible to tell when it is up by using the gage shown in Fig. 10. It is often necessary to face back one rim of a pair of wheels ¼ in. or more to make them central with the hubs. When new axles are mounted, the rims of the wheels will seldom run true in the lathe, and it may be necessary to face the wheel rims and reset the tires.

When a pair of wheels pass through the wheel lathe, and it is known that

"second-hand" tires are to be applied, a narrow strip on the inside of the rim may be faced clear around the wheel. By measuring from this faced strip on the wheel to the opposite tire with a slip gage it is possible to set the first second-hand tire applied so that the flange will run perfectly true. It is necessary that the back of each tire be true within 1/16 in. so that when the flange is machined in the wheel lathe it will be the same thickness all the way around. Even new tires should always be turned in the wheel lathe, if the shop has one, to make them all exactly the same size, and the treads and flanges perfectly true.

A tire having three layers of shim is considered defective by government inspectors. Two layers of shim is also considered bad practice, for, if the tire ever slips in service, the ends of the shim might overlap, making a layer of three shims—a government defect. Tire shim is now manufactured in sizes varying by 64ths of an inch from 1/64 to 3/8 in., so that there is seldom excuse for using two layers except in emergency work. The standard practice of one road requires that the shim be applied in one piece, if possible. These long pieces are hard to handle, but more than three pieces should be avoided, and no more than 1/4 in. of space should be left between the ends. A mechanic doing much of this work should have already figured and jotted down the circumference of different standard size wheel centers. The individual wheel centers do not vary greatly from standard, as 3/8 in. undersize is often set as the limit of turning for a wheel center. Shimming a tire when the wheels are out from under the engine, on horses, presents no special difficulty, but shimming a tire under the engine without stripping off the rods or other machinery is a rather disagreeable job. In handling work of this kind, part of the secret of success lies in knowing what will have to come off to do the job, and removing these parts at the start. In some cases the locomotive repair equipment has not kept pace with the size of the engines. Fifteen years ago, 25-ton jacks were suitable for jacking up wheels and engines, but to raise heavy modern power, 50-ton ball bearing jacks are almost a necessity.

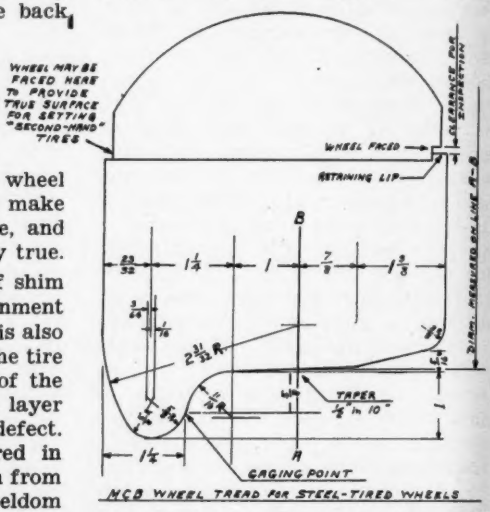
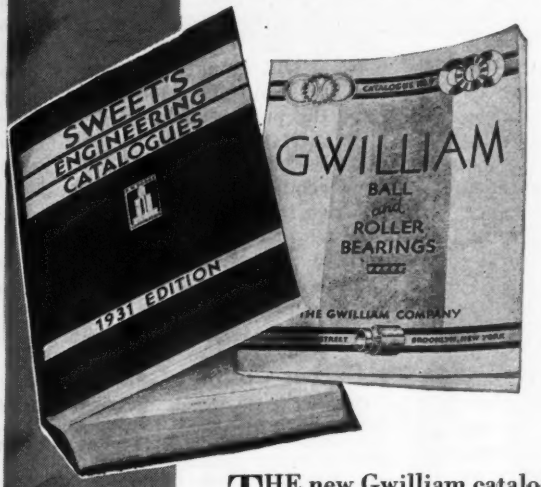


Fig. 10—M.C.B. Wheel Tread Gage for wheels.

Difficulty is sometimes experienced in shimming tires that are out of round. A shimming wedge may be used to advantage to give the necessary clearance between wheel and tire to insert a shim, or, if the tire is tight near the counterweight, it may be knocked part way off, and then, by using a bar between the tire and counterweight, the tire may be sprung away from the wheel far enough to insert the shim. Very thin shims sometimes catch on the edges of the pockets in the rim of the wheel. This



The GWILLIAM CATALOG *complete* is filed in SWEET'S ENGINEERING CATALOGUES for 1931

Duplicate copies sent on request.

THE new Gwilliam catalog is now on file in Sweet's Engineering Catalogues for 1931, pages 1391 to 1406.

There, in convenient form, readily accessible at all times, you will find complete information on

GWILLIAM BEARINGS

Whether you are planning to use many bearings for original installations or only one to replace a worn bearing, large or small, you will find our new catalog of interest.

Gwilliam thrust bearings and journal roller bearings are made in a full range of standard sizes; other sizes and special design bearings can be made to order in any quantity—*one bearing or one thousand.*

THE GWILLIAM COMPANY

360 FURMAN STREET BROOKLYN, NEW YORK

is caused by slight burrs on the edges, which bend in when coming to the edges of the pockets. When a shim catches in this manner, it should be pulled out and a new piece tried. New wheels are now cast without pockets except in the counterbalance.

After taking the wheel size, that is, the average size of the wheel, the slip gage or inside caliper is set to the wheel size minus the shrinkage allowance. This is best done by a feeler gage on which steps are cut, each one the correct shrinkage allowance for a different size of wheel centers. By using such a feeler between the ends of the calipers in setting the slip gage, most of the guess work is eliminated. Having thus set the slip gage to the size the tire should be, it is placed inside the tire, and the difference between the gage size and tire size measured at two points, 90 degrees apart, on the inside circumference of the tire. Tires are frequently out of round, so the amount may not be the same, but the figures added together and divided by 4 will give the correct thickness of shim to use; one-half the amount to determine the mean or average amount the tire is oversize, and one-half of this mean to give the shim thickness, as the shim goes completely around the tire. It is not necessary to take the tire size in three or more places because tires out of round approximate an ellipse, and the mean of two diameters 90 degrees apart will be the correct mean diameter.

A tight tire struck with a sledge will ring as if the metal were a solid piece, except in the case of main tires, which have a flat sound on account of the large amount of lead in the counterbalance. A mark may be painted across the tire with white or yellow paint, and then, if the tire ever slips on the road, the defect will be detected and the tire can be shimmed before a possible failure results. This method of marking tires is used when engines are broken in on a "slipping track;" that is, a stretch of oiled track where the drivers are spun around, as a substitute for a break-in trip on the road. Such a break-in method will quickly show up a loose tire and sometimes loosen tires that have the proper shrinkage. If a tire is suspected to be loose, the burner may be put on, and the interval of time required to loosen it noted. If the tire loosens up in less than four minutes, using a burner as herein described, the tire probably has less than standard shrinkage and should be shimmed.

Barber-Colman Catalog "H"

Catalog "H," which has been released by the Barber-Colman Co., Rockford, Ill., describes and illustrates the complete line of hobs, milling cutters, reamers, and machine tools made by this firm. It contains 198 pages, 5¼ x 7½ in. in size, and is divided into three general parts as follows: First; standard and special hobs, hobbing machines, and engineering data and other information concerning gear cutting. Second; standard and special milling cutters of all kinds, these being made in accordance with the American Standard for Milling Cutters, approved by the American Standards Association in April, 1930. Third; standard and special reamers, and the reamer sharpening machine.

A great deal of useful and interesting information is included, such as instructions for sharpening hobs properly, a description of the process of manufacturing a hob, tables of gear tooth terms and gear information, rules and formulas for gearing of all kinds, sprocket wheel formulas, hardness tables, instructions for grinding reamers and milling cutters, and so on.

A copy will be sent free to any machine shop executive.

By mentioning MODERN MACHINE SHOP when writing to the firms who are advertising in this issue, you are helping to build up a bigger and better magazine for your own benefit.

"SAVES US AT LEAST 4/5 OF THE TIME . . ."

"...and had proved a life-saver to us in many instances"

says

LIEBEL-FLARSHEIM COMPANY

Mr. E. S. Flarsheim goes still further to say that he would not part with his "Nibbler" for ten times its cost, providing he could not replace it.

This is one of many letters in our files which testify to the benefits of the Campbell Nibbling Machine. It is made in sizes to handle stock up to ⅜" thick. Sheet steel, chrome-nickel (stainless steel) alloys and many composition materials such as Bakelite and celluloid are quickly and easily shaped.

Internal and external designs are cut 40 to 60 times as fast as drilling. In many instances no further finishing is required. Write for literature and prices. Address:

ANDREW C. CAMPBELL, Inc.
BRIDGEPORT, CONNECTICUT
An Associate Company of the American Chain Company, Inc.

ACCO

CAMPBELL NIBBLING MACHINE

INDEX

Issued by The Index Machinery Corp.

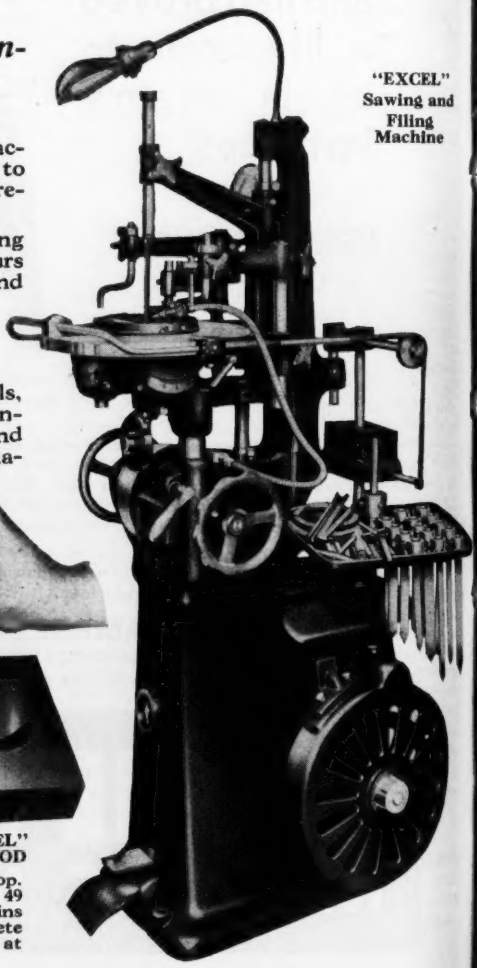
User Cuts Die Making Costs 75%

Saves 13½ Hours Finishing Intricate Die

A LARGE, well-known manufacturer had an intricate die to make, which by an old method required 18 hours to complete.

An "EXCEL" Sawing and Filing machine did the work in 4½ hours .... cutting his cost 75% .... and maintaining a closer degree of accuracy.

That's why so many manufacturers prefer an "EXCEL." It enables them to finish dies, tools, templates, etc., no matter how intricate their design, in less time and with less effort than any other machine or method we know.



"EXCEL" Sawing and Filing Machine

OLD METHOD

"EXCEL" METHOD

Investigate the "EXCEL" for your shop. Write to the Index Machinery Corp., 49 Central Ave., Cincinnati, O., for bulletins describing this tool, as well as the complete line of saws and files carried in stock at all times.

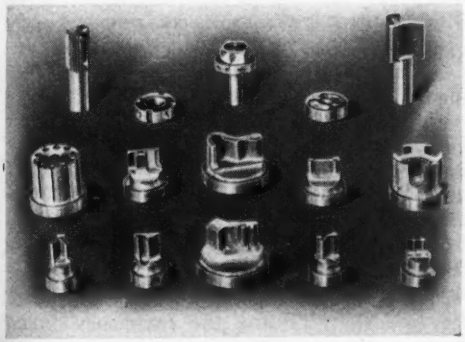
NEWS

49 Central Avenue, Cincinnati, Ohio

INDEX

"Now we finish Punches in ONE Chucking"

Users Say of this Universal Tool Miller

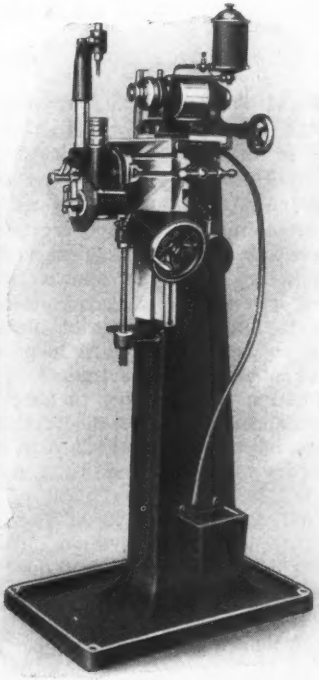


SAMPLES OF WORK

THAT is the feature, so they have told us, which makes the Universal Tool Milling Machine so valuable to shop executives. One chucking is the feature which enables operators to work to closer precision limits and improve the accuracy of punches, thereby guaranteeing that all cuts are concentric, no matter how intricate the shape.

For example, the above photograph shows samples of work various users are doing. All these parts were made in one chucking. Notice the variety of shapes.

Then there is the convenient arrangement of all working levers. The operator does not have to leave the front of the machine at any time. He can conveniently reach all levers when necessary from the operating position and keeps his work in full view at all times.



THE UNIVERSAL TOOL MILLING MACHINE

There are many more features of the Universal Tool Milling Machine you should know about. Get the details! Write to the Index Machinery Corp., 49 Central Ave., Cincinnati, Ohio for a catalog.

Simplicity and Accuracy are Features of this Inventory System

Is Inventory-Taking a Night-Mare in Your Plant? The Methods Outlined Here May Eliminate Some of Your Troubles.

By J. J. BERLINER

BECAUSE cost-finding provides for the keeping of a perpetual inventory, it does not necessarily follow that the taking of physical inventories is entirely eliminated. Physical inventories must be taken at regular intervals and the cost accounts verified with actual facts, as shown by an actual cost of the items of stock on hand in the raw material, finished parts, as well as the work in process in the operating departments. This verification is necessary to ascertain the existence of possible discrepancies. Where haphazard methods are used, inventory-taking is usually a much-dreaded task. At the plant of the Pressed and Welded Steel Products Co., Inc., where the system outlined here is in use, the task is reduced to its simplest terms and is completed with accuracy and despatch.

Even where an up-to-date cost system is in use, adjustments in the valuation of inventory items have to be made from time to time. For example, certain items may become obsolete, or market conditions both as to the purchase of materials and the sale of finished product may change, making it necessary to adjust the valuations of certain items when financial statements are prepared. A cost system does, however, eliminate the necessity for taking a complete physical inventory in a limited time for the reason that, values being recorded in the books, the physical count and check may be done gradually and the work spread over the year. This method is used when the records of the cost system are reliable and form a basis for a physical inventory. When no cost system is in operation and it is desired to ascertain the financial condition of the concern, an actual physical count of all items comprising the merchandise inventory must be made at a definite time.

Testing the Inventory

When different portions of the merchandise inventory are tested at different times during the year, it is often practicable to have a fixed schedule showing what items should be tested and the dates when the tests should be made. A simple inventory test form is given in Form 1. This form is intended for testing the correctness of the entries in the detailed stores ledger accounts, finished parts, and finished stock accounts. It may provide for a test as to qualities only or for valuations as well.

The information as to the actual amounts and quantities should be shown on the form and these amounts should be compared with the balances

of the ledger accounts. Any differences should be investigated, as it may be found that various charges and credits have been posted to the wrong stores ledger accounts. These clerical errors should be adjusted and the inventory discrepancies eliminated. When, after thorough investigation, the differences cannot be located, provision should be made for charging the items to an Inventory Adjustment account on the general ledger. This will guard against the "covering up" of this information.

Inventory Adjustments

Inventory adjustments should not be absorbed into the factory overhead without calling the attention of the management to their necessity. If a record of these items is established, comparisons may then be made with future periods until the adjustments reach a minimum. Under certain conditions these adjustments may need to be made because of thefts, short-weights, or intentional tampering with the stock. In such cases, the loss should not be absorbed in the factory overhead, but should be charged to profit and loss and a special deduction made.

In many businesses, it is the practice to give stock away as samples or for other purposes, often without any record of their disposal. If the records are to be accurate, the cost of such gifts should be charged to a Sample Expense account and included among the selling expenses. Gifts also may be a selling or administrative expense charge and as such should be deducted from the factory gross profit. The value of free goods is often not realized until a record is kept of their amount.

For the purpose of checking the controlling inventory accounts, the information shown upon the detailed inventory test forms may be summarized upon a regular inventory sheet such as is shown in Form 2. This form is more or less standardized and is sold by large stationery houses. It may be used for summarizing the inventory of raw materials and supplies, finished parts, and finished stock items when actual physical or book inventories are calculated.

INVENTORY TEST

Department..... No.....
Article..... Date.....

Actual Quantity.....Price $.....Amount $.....
Book Quantity.....Price $.....Amount $.....
Difference Quantity.....Price $.....Amount $.....
Remarks.....
.....

Taken by..... Checked by.....
Priced by..... Investigated by.....
Extended by..... Approved by.....

Form 1. Inventory Test. (Size, 8x5 in.)

The items of work in process may be summarized upon a specially ruled inventory sheet, such as Form 3. It should provide columns for details as to the material, labor and overhead costs.

Physical Inventories

Where no perpetual inventory is kept, a physical inventory should be taken at least once during the fiscal year, for the purpose of ascertaining the financial condition. In large manufacturing plants the taking of a

physical inventory is often a burdensome and complicated undertaking. The listing and counting of the items composing the merchandise on hand is usually made upon inventory sheets similar to those of Form 2 and Form 3. This method of taking the inventory is, however, unsatisfactory in that too often the work is done hurriedly and in haphazard fashion.

INVENTORY SHEET

.....DEPARTMENT

No.....

Date.....

Listed by..... Extended by.....

Checked by..... Added by.....

Priced by..... Approved by.....

Quantity	Description		Price		Amount	

Form 2. Inventory Sheet. (Size, 8x11 in.)

A cost system, to be accurate, must be based on the facts shown by a physical merchandise inventory. Therefore, it is most essential that the latter should be complete and thorough. The failure of a cost system can in many cases be traced to the use of an inaccurate inventory as the starting point. Discrepancies appear in the balances within a short time, and in explanation of these discrepancies the suggestion is made that they are perhaps due to errors in the opening inventory. This throws the whole system out of gear and is a frequent cause of discouragement to those who are making a sincere effort to keep accurate record.

In considering the taking of a physical inventory, the following points should be noted:

1. Preparatory work for the inventory.
2. Instructions to be issued.
3. Method of taking the inventory.
4. Method of listing items.
5. Method of pricing items.
6. Method of figuring items.
7. Method of checking the inventory.
8. Method of proving and summarizing the inventory.

Preparation For Physical Inventory

Some time before the date for taking a physical inventory, instructions should be issued to the factory foremen and factory clerks to prepare for this work, which will be done during a certain period. In large plants, all manufacturing operations should cease while the inventory is in progress, as it is impossible to make an accurate count of items while the plant is in operation. In smaller plants it may be possible to take a fairly accurate inventory while work is being done, but these instances are few and accuracy may be sacrificed for the sake of speed.

The preparatory work consists of cleaning up the stockrooms and operating departments to see that all items are stacked in an orderly manner. Raw materials that are found on workmen's benches or in the operating departments should be sent to the stock-rooms to be placed in the proper bins, drawers, or racks. Material of

No Lilliputian surveyors needed

Not even a man-sized toolmaker to check this piece. It was bored and checked to "tenths" on the P & W Jig Borer.

Do you buy precision boring from tool shops? And do you pay for it on a time basis?

Find out if the tool shop uses a Pratt & Whitney Jig Borer. For how can a shop without it compete in time, price and accurate work with a Jig Borer that visibly checks its own work while the work is in progress, and does it as accurately as an inspector can re-check the work?

Most shops using the Pratt & Whitney Jig Borer (and there are hundreds), have eliminated the entire cost of "bench-checking" work done on the Jig Borer.

Lowest cost precision boring, either in your own plant or the tool shop you use, is dependent upon the Pratt & Whitney Jig Borer. You should study our circular describing it.

AMERICAN JIG BORING METHODS

PRATT & WHITNEY CO.
Hartford, Conn.

Sales Offices and Agencies in

BIRMINGHAM, BOSTON, CHICAGO, CINCINNATI, CLEVELAND, DETROIT, LOS ANGELES, NEW YORK, PHILADELPHIA, PITTSBURGH, ROCHESTER, SAN FRANCISCO, ST. LOUIS

PRATT & WHITNEY

INVENTORY SHEET—WORK IN PROCESS

For....., 19.....

No.....

Listed by..... Priced by..... Calculations verified.....

Checked by..... Extended by..... Approved.....

			COSTS							
Order No.	Quantity	Description	Total		Material		Overhead		Labor	

Form 3. Work in Process Inventory Sheet. (Size, 9x12 in.)

like character should be grouped or stacked in some orderly arrangement so as to enable a rapid count to be made. Material hidden away in corners or "nooks" of the store-rooms and departments should be brought out where it will receive attention. Obsolete items or materials which are slow-moving should be stacked separately.

Special orders, standard product orders, repair orders, and construction orders which are in process in the operating departments should be kept in distinctive piles. The work in process is often difficult to describe in the inventory, and therefore all items that can possibly be transferred to stock or reach a definite state of production should receive attention while the preparatory work is being done. Some of this preparatory work can be handled only when the plant is shut down, but a large part of it may be done beforehand.

Department foremen sometimes try to rush the current work through and transfer it to subsequent operating departments so that they will have little to do when the time comes to take the inventory. As this practice may disorganize production, it should be discouraged.

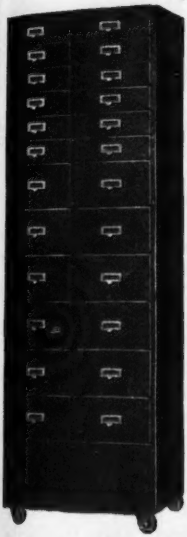
Instructions As to the Taking of the Inventory

Instructions as to the method of taking the inventory should be given to all employees responsible for the counting, entering, checking, listing, pricing, calculating, summarizing, and proving of the items. Instructions should be plain and should specify that the machinery, tools, and miscellaneous equipment are not to be included in the inventory. If an inventory of these items is desired, it should be taken separately upon records prepared especially for the purpose.

The instructions should be typed and handed to the clerks responsible for the work so that they will know exactly what to do and the manner in which it should be done. This in-

STORE *with* STEEL

FOR SAFETY AND SAVINGS



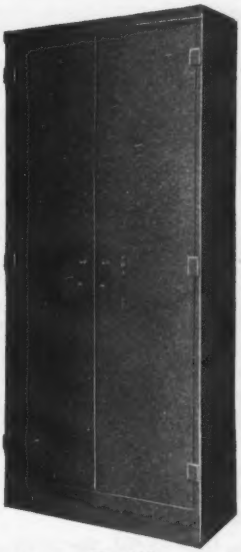
No. 24

No. 24—Interior frame of angle steel covered with sheet steel outside. Has 24 drawers, two tiers of 12 drawers. Twelve top drawers are 10" wide x 15" deep x 3" high inside. Twelve bottom drawers, 10" wide x 15" deep x 6" high inside. Drawers equipped with combination brass label holders and pulls. Overall size, 69½" high x 24" wide x 16" deep. Mounted on 2" diameter steel swivel casters. Olive green lacquer finish.

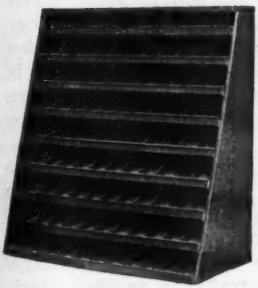
No. 212—Convenient both for office and factory use. Fire-resisting, vermin and dust-proof. Reinforced double doors, equipped with double handles; 4 shelves, adjustable on ½" centers. 78" high, 36½" wide, with 4 depths, varying from 12" to 24".

No. 108—Sheet-steel, 9 shelves with 12 compartments totaling 108. Label holders run full width of shelves. Overall: 34" high, 35½" wide, 6½" depth (top), 18" deep (bottom).

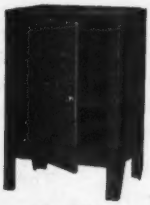
No. 36-24—Tool Cabinet. Overall: 36" high, 24" wide, 16" deep; adjustable shelves.



No. 212



No. 108
Drill and Reamer Bin



No. 36-24

No. 12-24

No. 36

No. 12-24—Cabinet, with 12 drawers. Inside measure, each drawer: 24" wide x 18" deep x 3" high.

No. 36—Cabinet. Internal frame angle steel, covered with sheet-steel, 36 drawers. Overall: 69½" high, 24" wide, 16" deep. Drawers: 10" wide x 15" deep x 3" high.

Write for complete catalog C-MMS and price list of twenty stock patterns of all-steel cabinets, or built special for you.

ANGLE STEEL STOOL CO.

PLAINWELL, MICHIGAN

formation should cover the order of counting and entering the items and the descriptions to be entered upon the inventory sheets or tags. Any instructions covering work in process should be explicit. When only partial information is sent to the office, costs cannot be properly calculated because the description of the job is not sufficient to identify it.

Taking the Inventory

The method of taking the inventory depends to some extent upon the layout of the plant, the products manufactured, and the existing conditions and time allotted to the task. Rarely is sufficient time allowed for accurate work, the tendency being to rush it through as one of the burdens and "bug-bears" of office detail. Therefore, factory employees who may be delegated to this important task do not realize its bearing on the financial statements prepared at the end of the fiscal period.

If possible, the work should be done by men who are experienced in clerical detail and who also have a knowledge of the product, operations, and processes. Where a complete cost system is in use, the stock and factory clerks are usually qualified by experience and clerical training to take a complete physical inventory. The work should be supervised by a responsible official, such as the factory superintendent, production manager, head cost accountant, purchasing agent, or head stock clerk, who know the value and realize the importance of accuracy.

In large plants it is well to divide the supervision so that one official may be held responsible for each section of the inventory. For example, the head of the purchasing department or head stock-room clerk, may be made responsible for the raw material items; the factory superintendent or production manager may be responsible for the finished parts and work in process items; the head clerk of the finished stock department, or head of the sales department, for the items of finished stock; while the head cost accountant or clerk in charge of the cost department may be the supervising authority over all, to whom all questions regarding the inventory may be referred.

In taking inventory, the old-fashioned method of doing the actual listing in the factory is found to be impracticable in large plants and is becoming more and more obsolete. One reason is that items are often overlooked, and another is that when the men listing the items are interrupted, the tendency is to forget where they left off. As the articles themselves do not show any mark, it is often impossible to tell very readily which items were listed and which were not listed.

What is known as the "Inventory Tag Method" does away with the drawbacks mentioned, and for this reason has become more or less the standardized method in most manufacturing and mercantile industries. The principle of this method is that every item to be inventoried must be tagged. The tags are simple, containing the information shown in Form 4.

The tags should be numbered in advance and may differ in color for use with the different classifications of the inventory. For example, white tags may be used for raw material stock items, buff for finished stock, pink for finished parts stock, and green tags for work in process. Or, again, different colored tags may be used for the various stock-rooms and operating departments. Where the inventory is not a large one, little is gained by the use of different colors as all tags are numbered in advance.

Definite series of numbered tags should be given to the persons who

FORMICA GEAR CUTTERS

The Akron Gear & Eng. Co.
Akron, Ohio
Farrell-Birmingham Co., Inc.
Buffalo, N. Y.
Slayman & Company
Baltimore, Md.
Harry A. Moore, Bangor, Me
The Union Gear & Mach. Co.
Boston, Mass.
The Atlantic Gear Works
Brooklyn, N. Y.
Chicago Rawhide Mfg. Co.
Chicago, Ill.
Perfection Gear Company
Chicago, Ill.
Chicago Gear Company
Chicago, Ill.
The Cincinnati Gear Co.
Cincinnati, Ohio
The Greaves Machine Tool Co.
Cincinnati, Ohio
The Horsburgh & Scott Co.
Cleveland, Ohio
The Stahl Gear & Mach. Co.
Cleveland, Ohio
The Master Electric Co.
Dayton, Ohio
The Adams Company
Dubuque, Iowa
The Ferguson Gear Co.
Gastonia, N. C.
Excello Machine Co.
Grand Rapids, Mich.
Hartford Special Machinery Co.
Hartford, Conn.
Precision Machine Co.
Milwaukee, Wis.
Joaquin Alemany Lopez
Havana, Cuba
Dolman Foundry & Machine Co.
Houston, Texas
The Generating Gear Co.
Milwaukee, Wis.
Mobile Pulley & Machine Wks.
Mobile, Ala.
Berkley Mach. Works and
Foundry Co., Norfolk, Va.
Meisselbach-Catucci Mfg. Co.
Newark, N. J.
Sier-Bath, Inc.
New York City, N. Y.
E. M. Smith Machine Shop
Peoria, Ill.
The Earle Gear & Mach. Co.
Philadelphia, Pa.
The Pittsburgh Machine &
Supply Co., Pittsburgh, Pa.
Standard Gear Company
Pittsburgh, Pa.
Rodney Davis and Sons
Philadelphia, Pa.
The Turley Gear & Machine Co.
St. Louis, Mo.
Perkins Machine & Gear Co.
Springfield, Mass.
Winfield H. Smith, Inc.
Springville, N. Y.
Alling Lander Company
Sodus, N. Y.
Charles E. Crofoot Gear Corp.
South Easton, Mass.
Arlington Machine Co.
St. Paul, Minn.
Diefendorf Gear Corp.
Syracuse, N. Y.
Worcester Gear Works
Worcester, Mass.
Massachusetts Gear & Tool Co.
Woburn, Mass.

FORMICA

GEAR on a Big Water Pump

> THIS heavy water pump in the plant of the Bay State Fishing Company, marketers of Forty-Fathom Fish, is equipped with a Formica Gear installed by the Union Gear and Machine Company of Boston. The gear has been giving excellent service.

Formica gears greatly reduce noise—and improve working conditions. They are being used on more and more production machinery. In devices for the home, the office, and the store, quiet operation is essential and Formica provides it.

The gear cutters named on this page can give you prompt service when you need a replacement gear.

THE FORMICA INSULATION COMPANY
4640 Spring Grove Avenue, Cincinnati, Ohio

FORMICA *Non-Metallic* GEARS

are to enter upon them the description of merchandise inventory, and these should be receipted for and a record kept at the office as to the person responsible for each such series. The quantity of tags given to an individual will, of course, depend upon the number of items he has to inventory, and he may obtain more as required by signing for their receipt.

INVENTORY TAG

DATE..... No.....

Order No.....

Quantity .....

Articles and Description:

.....

.....

.....

.....

Form 4. Inventory Tag. (Size, 3x4 in.)

The men who will do the actual counting and entering of the inventory should attach these tags to the various articles. All items of stock in all departments, whether finished stock, finished parts stock, or work in process, and also each different kind of goods composing the raw material inventory, should be tagged separately in order to arrive at the quantity on hand of each particular article or material.

The tags may be attached in a conspicuous manner to a bin, tray, or holder, or tied to an article which forms part of a bundle or stack of material. After all the items in a particular department or stock-room have been tagged and the entries made, the inspectors should test some of the items. Under some conditions, it may be necessary to recheck and verify the entries on the tags of every detailed item. This is especially true where the business is being terminated by reason of a sale or liquidation.

After the inspectors are satisfied that all items have been properly counted within a particular department, the tags may be removed from the stacks of articles, after which operations may be resumed, provided these do not interfere with the inventory work of any other stock-room or department.

After the tags are collected, they should be arranged in serial number to see that none are missing. If any disappear, an inventory may be incomplete as to those items, but with a reasonable amount of care missing tags may be reduced to a minimum. All tags, including those which may have been voided, should be returned to the office, and after all have been accounted for, the inventory may be listed.

Listing the Inventory

Under some circumstances the tags may contain prices and total costs and be kept as a permanent inventory record, the listings being done upon adding machine slips. In other cases, it is well to provide for a complete listing of the inventory upon forms similar to Forms 2 and 3.

In listing the items care should be taken to see that the description, quantity, and other reference marks are properly recorded upon the inventory sheets. It is often well for another set of clerks to call off the details from the tags and verify the information on the sheets. Items of the same kind should be grouped together on separate inventory sheets.

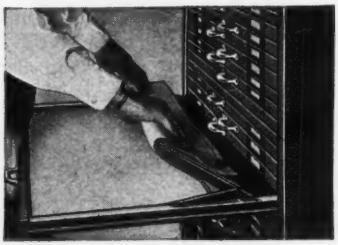
The items of raw material, work in

(Continued on page 70)

GOOD BUSINESS

The Calumet Shallow Drawer Unit

It is good business to install Hamilton-Calumet Plan Files. A small percentage of the value of your tracings will insure their safety. Calumet files increase filing efficiency, afford greater protection and safety.



Tracing Lifter in Action

The shallow drawer units are especially designed for active tracings and have the patented Calumet Tracing Lifter. It is semi-automatic and makes every tracing a top sheet. It makes filing simple and safe.

Use the Coupon ☞

HAMILTON MFG. CO.

Two Rivers, Wis.

HAMILTON MFG. CO., Two Rivers, Wis.
Please send me Catalog No. 9-MS.

Name.....

Firm Name.....

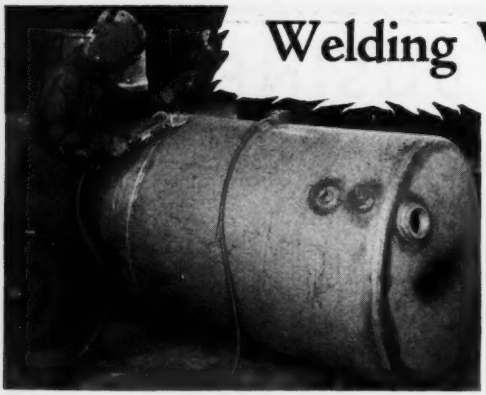
Title.....

Address.....

City.....State.....

Welding With Atomic Hydrogen

By J. F. SPRINGER



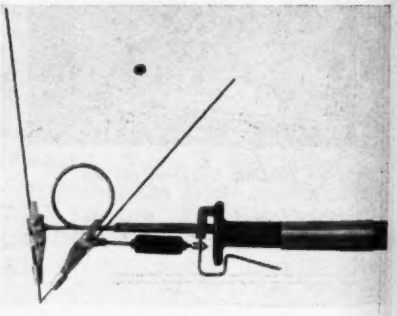
Using the Atomic Hydrogen welding process in the fabrication of a Monel Metal gasoline storage tank at the plant of the Liberty Coppersmithing Co., Philadelphia.

MANY years ago, ordinary hydrogen was introduced to the world as an excellent fuel for the production of high temperatures. By combining it with oxygen, instead of air, hydrogen was found to provide a splendid torch for the melting and welding of metal. But a mixture of acetylene gas and oxygen would do the same thing. In fact, as the time passed, the process of welding metals by the use of the oxy-acetylene torch became the more popular method.

Within the last few years, however, a new method of utilizing hydrogen has been developed, and its field of usefulness is constantly increasing. As used by the older methods, hydrogen was in its normal condition. As used in the newer process, however, the hydrogen is in the atomic condition. Heat is applied to break the molecules of hydrogen into atoms, then the atoms are driven to a nearby point where they re-combine. This process of re-combining is what produces the intense heat which is the feature of the process.

In the atomic hydrogen process, a combination of the electric arc and a gas flame is used. The electric arc breaks up the ordinary hydrogen into atomic hydrogen, then the atomic hydrogen is blown out from the arc, in which process it is used to melt and fuse metal in what we call the welding process. As the electric current passes between the tungsten electrodes, a jet of ordinary hydrogen is drawn between the electrodes and there converted into atomic hydrogen by the intense heat of the arc.

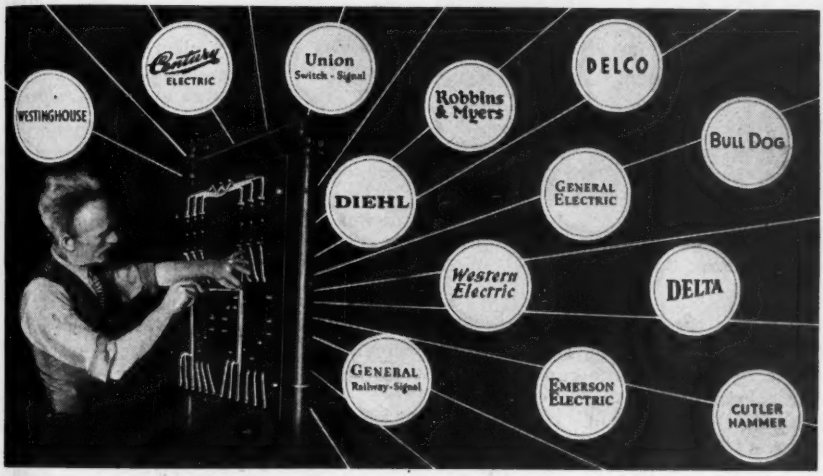
According to C. I. MacGuffie, who is an expert in this line of activity, the temperature of the atomic hydrogen flame is about 4030 deg. Centri-



Torch used for welding by the Atomic Hydrogen Process.

grade (7286 F.) at atmospheric pressure, as compared with approximately 3200 deg. C. to 3300 deg. C. (5792 to 5972 deg. F.) for the oxy-acetylene

MAKERS OF ELECTRICAL EQUIPMENT SAVE IN ASSEMBLING SLATE, EBONY ASBESTOS, BAKELITE, DUREZ, STEEL



Make superior fastenings at lower cost with Self-tapping Screws

Manufacturers who make fastenings to slate, ebony asbestos, Bakelite, Durez and steel can profit by the experience of the leading makers of electrical equipment. For these concerns have solved the problem of making fastenings to such materials securely and economically. They use Hardened Self-tapping Screws and Hardened Metallic Drive Screws.

A cost comparison on a test assembly job, which led to the wide use of Self-tapping Screws by a great concern named above, is sufficient to show the notable economies effected by these Screws. This manufacturer adopted Self-tapping Screws in place of lead anchors and wood screws for the job of fastening cleats and other wiring devices to switchboard panels. Comparison of costs proved that Self-tapping Screws saved $3,120 a year in time, labor and material. A stop watch showed that a workman could make a fastening in 13 seconds less time. Before adopting the Screws for other assemblies, they also subjected them to security tests which demonstrated that Self-tapping Screws actually make stronger as well as cheaper fastenings.

It will pay you to carefully consider Self-tapping Screws for your own fastening jobs. Let our Assembly Engineers tell you whether you can use these Screws to advantage. It costs nothing. Just attach a description of one or more assemblies when you mail the coupon for the booklets below.

Type "Z" Hardened Self-tapping Sheet Metal Screws

For joining and making fastenings to sheet metal up to six gauge; also aluminum, die castings, Bakelite, etc. Simply turn Screw into drilled, pierced or molded hole. It forms a thread in the material as it is turned in. Can be removed and replaced.

Type "U" Hardened Metallic Drive Screws

This type of Self-tapping Screw is used for making permanent fastenings to iron, brass and aluminum castings, steel, Bakelite, Durez, etc. Just hammer the Screw into a drilled or molded hole. It forms a thread in the material as it is driven.

PARKER-KALON *Hardened* Self-tapping Screws

PAT. IN U. S. AND FOREIGN COUNTRIES

← 14 Unbiased Reports on Savings.....Scientists Explain Fastening Security →

PARKER-KALON CORPORATION, Dept. E, 190-196 Varick Street, New York, N. Y.

Send me free booklets on the Security and Economy of assemblies made with Self-tapping Screws.

Name and Co._____

Address_____

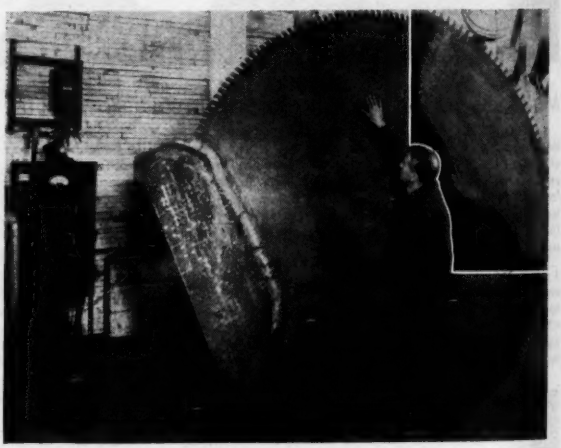
Welding a combustion chamber for a gas-fired furnace, using the Atomic Hydrogen welding method. Emil Steinhorst & Sons, Utica, New York.

flame. The rate of heating of the surface to be welded by means of the atomic hydrogen flame can be varied over a wide range by changing the current in the arc. Heavier currents result in a larger, fan-shaped flame, and while the welding temperature remains practically constant, the rate of surface-heating is materially increased.

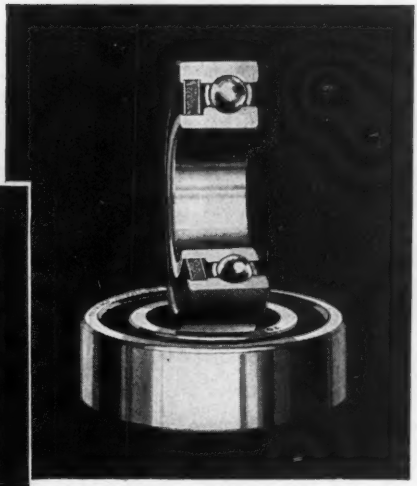
Hydrogen produces a "reducing" flame. That is, the hydrogen flame is eager for oxygen, which appears to be a valuable asset. When metals are highly heated, they are often corroded by the oxygen from the surrounding air. In welding, this corrosion may jeopardize the quality of the job. But it appears that the atomic hydrogen flame really acts as a protector, due to the fact that the hydrogen will absorb the oxygen before it can corrode the metals.

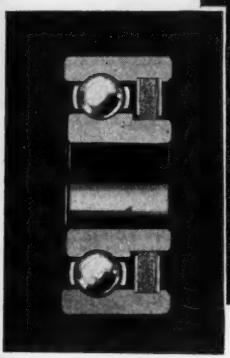
According to Mr. MacGuffie, "The reducing atmosphere provided by the hydrogen, which completely bathes the metal while in the molten state, makes this process ideal for the welding of non-ferrous metals and alloys which cannot be welded successfully with the ordinary electric arc. Most steels, including nickel, chromium, molybdenum, manganese, and cobalt alloys, are readily weldable. Steel with carbon content as high as 1.25 per cent has been successfully welded. Little difficulty is encountered with nickel or monel metal. This method of welding has proved itself especially adapted to aluminum work alone."

The atomic hydrogen process of welding is not considered as being directly competitive with other methods; rather, it may be regarded as supplementary. That is, it occupies a field of its own. However, it is not to be understood that the fields of useful-



A weld made in a 108-in. inserted-tooth saw by the Atomic Hydrogen process, after insertion of new section and before finishing of weld and milling of tooth sections. Shop of Vance Scales Co., Tacoma, Wash. (Upper Right)—Finished weld, ground even and with teeth in place.





We offer you the most extensive line of self-protected bearings in America. Write for Data Sheets 917-C and 926. Let our engineers aid you in selection and application.

Another all-steel, dust-and-dirt-proof, PRECISION Bearing... Wide, solid inner and outer rings, with maximum contact on shaft and housing... Interchangeable in overall dimensions with other makes... Can be clamped on both sides. Felt seal between removable plates, forming an effective labyrinth against recessed inner ring. ...Grease-packed for long service... Simplifies construction, reduces costs, improves performance... Made in a full range of sizes.

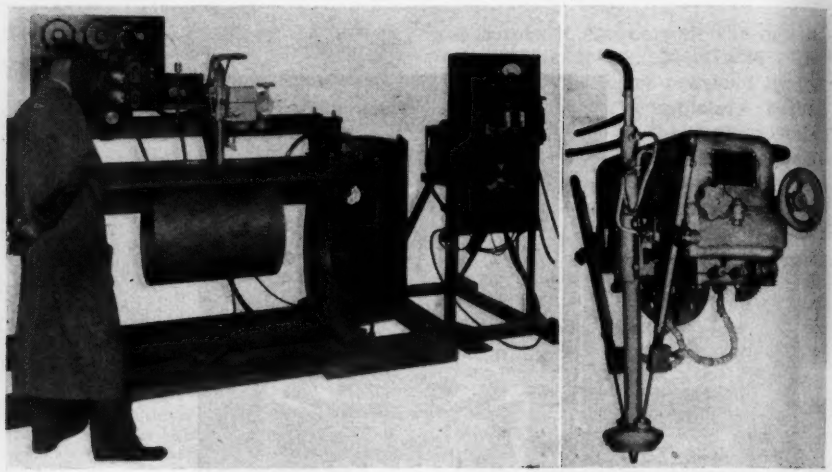
"7000" SERIES

"GREASEAL"

FELT-PROTECTED

BALL BEARINGS

NORMA-HOFFMANN BEARINGS CORP., Stamford, Conn., U.S.A.



(Left)—Automatic machine used in hydrogen welding. (Right)—Atomic hydrogen welding head for use on automatic machine.

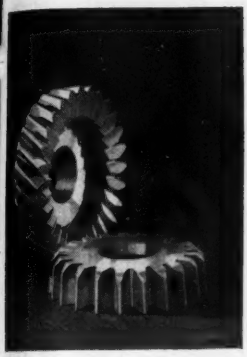
ness do not overlap, but the atomic hydrogen method is probably uneconomic where other methods are distinctly permissible. For example, the new method can be used in almost any kind of iron or steel fabrication, but it is actually used only where a very ductile or extremely smooth weld is required, or where the stock is too thin for other methods of welding.

There may, however, be a certain amount of cost offset in some cases. Thus, atomic hydrogen may in certain cases be used because of the resultant smoothness of the weld, which may eliminate necessity for finishing prior to enamelling or painting. This saving may be enough to cover the extra expense, or at least to provide substantial assistance in reducing it.

One of the advantages of the atomic hydrogen process in the welding of steel lies in the ductility of the weld. Assume that a job consisting of low carbon steel is to be welded. The material itself will be ductile because only a small amount of carbon has been added in the making of the steel. But if carbon is injected into the weld or into the highly-heated adjacent parts, the section affected will be more or less non-ductile, or brittle. In such a case, the usual method of fabrication is out of the question. The atomic hydrogen process may, however, serve the purpose, as hydrogen contains no carbon. Acetylene, on the other hand, contains plenty of carbon.

With the new process, welds in low carbon steel have been made of such ductility that a $\frac{1}{16}$-in. sheet could be folded twice through the weld. A weld that was made in $\frac{1}{8}$-in. plate was embossed, which proved its ductility. In another case, a tube was made of $\frac{1}{16}$-in. sheet, using the atomic hydrogen process to weld the seam, and the weld was then tested by flattening the tube at the ends in two directions at right angles to each other. There was no sign of cracking in either case.

Where the job can be properly backed and the clamping can be made



CONTROL TOOTH SHAPE

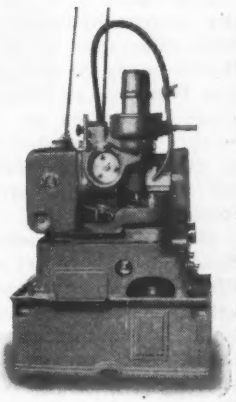
and you control the QUIETING of gear operation

THE Fellows Gear Shaper and Original Fellows Gear Shaper Cutters assure positive control over the tooth shape of involute gears.

The involute curve has proved most successful for gear teeth for the reason that its shape can be kept under control. Control of the involute shape, however, is dependent upon two main conditions: The shape **must** be **generated,** and to ensure duplication, the cutting tool must not only be a generating tool, it **must** be **generated** after hardening to remove all inaccuracies. Original Gear Shaper Cutters used on Fellows Gear Shapers provide the maximum in control necessary to produce quiet gearing.

Good gears do not **"just happen"**—they are the result of careful design and painstaking controlled manufacturing methods. Ask for a copy of our free booklet, The Involute Gear. You will find it both interesting and instructive. Write: THE FELLOWS GEAR SHAPER COMPANY, 78 River Street, Springfield, Vermont, or 616 Fisher Building, Detroit, Michigan.

FELLOWS
~ GEAR SHAPERS ~



Fellows High-speed Gear Shapers afford the maximum of control in the production of quiet gearing.

adequately, butt welds may be made with sheets as light as 22 gauge. Butt welds have been made with 24-gauge material, but a great deal of care must be taken with the clamping in such a case.

Welding Aluminum

In the welding of aluminum by the ordinary methods, two outstanding types of difficulties are usually encountered. The first is that it is difficult to avoid melting out a gap from the edge of a thin sheet, due to the low melting point of the material—about 1215 deg. F. The second is that the metal in the weld is susceptible to oxidation from contact with the air. Once oxidized, the metal has a tremendously high melting point and difficulties may develop which are hard to overcome with the torch alone.

Experience thus far indicates that the atomic hydrogen process meets both difficulties to a certain extent. It can easily be seen that the hydrogen tends to prevent the second of these difficulties by blanketing the work. As to the thin sheets, it is not so clear that the new method is as yet much, if any, advanced over the former method.

Mr. P. P. Alexander of the Thomson Research Laboratory of the General Electric Company, says: "The greatest obstacle to the welding of aluminum is the formation of aluminum oxide, which prevents the metal from running together. With atomic hydrogen welding, it is possible to weld aluminum, under certain conditions, without this danger of the formation of aluminum oxide, and it is even possible to reduce the aluminum oxide already formed to its metallic state. Still, it is not practical at the present time (1929) to use the atomic hydrogen process welding for welding thin sheets of aluminum without fluxes, on account of the desire to maintain a high speed of welding the thin materials. So that in practical applications of the torch for welding thin aluminum sheets, additional fluxes are used."

The atomic hydrogen process may be used satisfactorily in the welding of pure nickel, chromium, tungsten, magnesium, deoxidized copper, and Monel Metal.

Heavy Steel Boiler Plate

The atomic hydrogen method of welding is also applicable, upon occasion, to heavy steel boiler plate. It has been used by The Connelly Boiler Company of Cleveland, Ohio, in the construction of boilers, including a boiler which was 22 ft. long and 3½ ft. in diameter. The plate was of ½-in. stock and the heads were of ⅝-in. plate. The job was welded in 23 hours. The boiler was later subjected to a test in which pressure of 750 lb. per sq. in. was applied, with no sign of failure.

High Speed Steel Tips

Owing to the high cost of high speed steels, it is common practice to use common steel for the shanks of lathe and planer tools, with tips of the more expensive metal. Tips are welded to machine steel shanks successfully by the atomic hydrogen process, the welds having both strength and ductility.

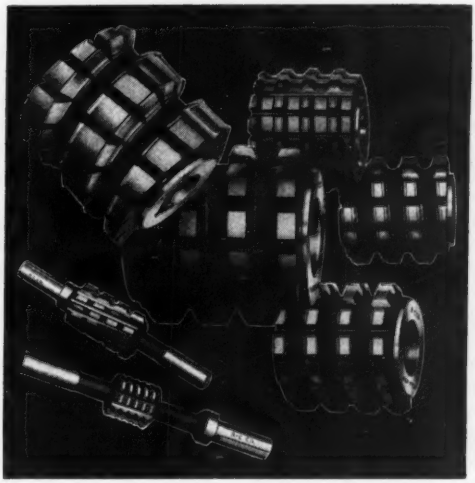
Automatic Welding

Those familiar with the development of the oxy-acetylene process will perhaps recall when, some years ago, power-driven welding apparatus was attracting attention. Electric welding is now done by the use of mechanical devices, as well as by hand, even with the arc process. So it is not surprising that the atomic hydrogen process has developed to the point where an automatic welding machine can, upon occasion, be employed.

Naturally, power-driven welding machines are used on welding opera-

(*Continued on page 73*)

BARBER-COLMAN



HOBS FOR SPLINE SHAFTS

We pioneered in the development of the Spline Shaft Hob. The first Hob of this type ever made was a Barber-Colman product. During the past twenty years the Hobbing Process has taken over an ever-increasing amount of Spline Shaft work, until today practically all production work of this kind is done with Hobs.

Barber-Colman Spline Shaft Hobs are made with extreme accuracy and, within the limitations of the Hobbing Process, will produce satisfactory Spline Shafts much more economically than by milling. For producing certain types of spline shafts where a straight-sided key to the root is essential, we recommend our Elongated Tooth Hobs whose specially formed teeth permit a milled bottom section and straight faced keys under production hobbing conditions.

BARBER B-C COLMAN

BARBER-COLMAN COMPANY

General Offices and Plant

ROCKFORD, ILLINOIS, U. S. A.

The Care of Leather Belting

By W. F. SCHAPHORST

THE principal enemy of the leather belt, insofar as the machine shop is concerned, is oil. There are oils on the market that stay put—that do not drip—and there are enclosed bearings that do not permit dripping, but the average shop has not yet arrived at the use of dripless oils and bearings. Consequently belts will, in the course of time, become more or less soaked with oil and not only become less efficient, but they will also deteriorate at an abnormal rate.

Some belts can absorb a certain amount of oil without serious results, but when the amount of oil absorbed becomes excessive, the belt will slip. When a belt slips in service, the result is a loss of power which is directly proportional to the amount of the slip. For instance, if the slippage amounts to 2 per cent, the power loss is 2 per cent and the production loss is also 2 per cent. If the belt slippage is 5 per cent, the power and production loss is also 5 per cent. In other words, percentage of power and production loss is identical with the percentage of belt slip.

The continued use of a leather belt that has become soaked in mineral oil will develop cracks in the belt, due to the abrasive action on the fibers in the leather. Natural animal oils, on the other hand, protect these fibers from sawing on each other. Harsh mineral oil removes this film of natural animal lubricant, and allows the fibers to contact and develop abrasion. Degreasing will remove the mineral oil and redressing with animal oil will replace the film on each fiber, restoring pliability and protecting the leather from further damage.

Excessive slippage may also cause burning of the belt. The friction caused by the slipping of a belt will develop a lot of heat in just a few seconds and the belt may be badly burned. And burning is often more serious than power loss, cracking, and abrasion combined. It can be very expensive.

There are two steps that may be taken to remedy the oil-soaked belting problem. First, take steps to prevent oil from leaking or splattering onto the belt. Improved types of bearings can be used, guards can be set up where oil cannot be prevented from splashing, and pans can be hung under the bearings on line shafting. Second, use a belt that is as immune to the effects of oil as possible, and then clean that belt periodically. If the first suggestion is followed, however, it will not be necessary to clean the belt.

A list of the cleaning agents that have been used to clean leather belts will include the following: gasoline, naphtha, kerosene, benzol, carbon tetrachloride, aqua ammonia, alcohol, and soda and water. The usual method consists in immersing the belt, loosely wound to a coil, on edge in the liquid and allowing it to stand over night. It is then turned over and allowed to stand on the opposite edge ten hours. As the oil soaks out of the belt, it usually carries a large part of the dirt with it, which settles to the bottom of the pan. The dirt that does not loosen can usually be removed easily by brushing or scraping. To hasten the drying process, the belt may be run through an ordinary clothes wringer. A putty knife

To the concern owning the oldest Dumore Grinder now in service

A New No. 5 Dumore absolutely FREE

To the principal, shop executive or workman who locates this grinder

$25.00 in CASH

Somewhere — perhaps in a small, one-man shop or in one of the World's largest manufacturing concerns — there is the oldest Dumore Grinder now in active service.

We want this grinder — and its history! To get it we will give to the concern now owning it, a brand new No. 5 Dumore Grinder in exchange for the faithful old tool that we are searching for.

And to further instigate a search for it, we will pay the principal, shop executive or workman who locates it and gives us its history, $25.00 in Cash!

Get busy now. Help us find this old grinder. Aid us in putting the story of Dumore dependability and vibrationless, precision performance before the World in a still more emphatic manner.

For, from the beginning, Dumore standards of quality and performance have been the very highest. Each year finds these standards higher. And as a result, the new No. 5 Dumore Grinder embodies all the resultant ideas and further enhances the splendid Dumore reputation.

DUMORE COMPANY, Racine, Wisconsin

TRADE MARK
DUMORE HIGH-SPEED GRINDERS
REG U S PAT OFFICE

or similar broad scraping tool with rounded corners will serve to scrape the belt. The fibers of a belt, whether the belt is of a leather or a substitute, must never be injured by a sharp tool.

The next operation consists in drying the belt. This process may be hastened by running the belt through an ordinary clothes wringer. The belt should then be laid flat on the floor and covered with dry sawdust, which should be scrubbed back and forth over the surface of the belt with a stiff broom. The process should be repeated on the opposite side of the belt. After this treatment, it is a good plan to pack the belt in powdered chalk, Fuller's Earth, or fine sawdust, and allow it to stand in a warm place for several hours. The warmth improves the capillary attraction and aids the material to absorb the oil. When the belt is dry, it should be lubricated with a suitable dressing, either of a type that is recommended by the manufacturer of the belt, or consisting of a mixture of neat's-foot oil and tallow, half and half.

If gasoline or naphtha is used to clean the belt, extreme care must be used to prevent an explosion. If gasoline is allowed to stand in an open place, such as in a pail without a cover, the room in which the pail is left will soon become filled with an easily-explosible mixture. Only a little gasoline is needed to render air explosive—1½ cubic feet of gasoline vapor to each 97½ feet of air. And naphtha is even more dangerous than gasoline. It is particularly necessary to see that there are no open flames, however small, in the room in which the cleaning agent is stored or used, unless the liquid is kept in an air-tight receptacle, such as in a corked bottle or a pail with a close-fitting cover.

It has been the practice, in some places, to apply hot irons to belting to drive out the oil. Blow torches have also been used, and, where available, steam has been used. Steam is preferable to hot irons, but even with steam the utmost caution must be exercised. Steam is an excellent cleaner for many purposes, it is true, but it must be remembered that many kinds of belts are not able to withstand the high temperatures of steam. The temperature of steam at atmospheric pressure is 212 deg. F. The higher the steam pressure, the higher the corresponding temperature.

A temperature of 212 deg. F. is too hot for most rubber belting. One prominent rubber belt manufacturer states that his belt is not affected by heat up to a temperature of 200 deg. F., but that where higher temperatures are to be encountered, he should be consulted. That is good advice regardless of the kind of belt involved.

Balata belting is more sensitive to high temperatures than rubber. The temperature of Balata should be kept down to less than 110 deg. F. At 125 deg., balata gum can be molded, therefore it is imperative that balata belting be protected from heat of any kind. According to one authority, oak tanned leather belting should not be subjected to a temperature higher than 115 deg. F., which means, of course, that oak belting, also, must not be cleaned with steam. It can't stand it.

Nor should impregnated cotton belting be cleaned with steam, as the steam will be very likely to wash out the impregnating compound. Without the compound, cotton belting does not give satisfactory results. Stitched canvas belting should not be used in temperatures higher than 140 deg. F.

Waterproof leather belting of the special mineral-tanned variety can safely be cleaned with steam, as it is not harmed at 212 deg. F. Care must be taken, however, to replace the

(Continued on page 73)

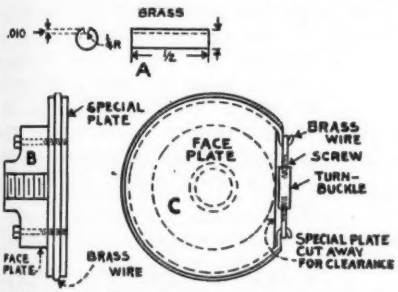
Ideas From Readers

This department is a clearing house for ideas. If there is a "kink" or short cut in use in your shop, send in a description of it. We will pay $5 for each one published.

Grooving 1-8-In. Wire

By CHARLES KUGLER

AMONG the parts that were required for a special machine job was a quantity of ½-in. sections of ⅛-in. brass wire, in each piece of



Drawing showing method of cutting grooves in ⅛-in. diameter wire.

which was required a groove, shaped to a ¼-in. radius and 0.010 in. deep. I first attempted to hold the wire in a milling machine and cut the groove with a ¼-in. radius cutter, but met with so many difficulties that I abandoned this method and devised the method described herewith.

I made a special plate and bolted it to the faceplate of a lathe, as shown at **B** in the illustration. The special plate was of approximately the same size as the faceplate, but was cut away at one side as shown at **C**. I then cut a V-shaped groove in the periphery of the plate to locate and hold the wire. The wire was cut to lengths just long enough to encircle the plate with enough left over to make hooks for the turnbuckle, as shown at **C**. As each section of wire was placed around the plate, the ends were hooked into the turnbuckle and the wire was drawn taut. The tool was set in position to cut the groove in the wire and the carriage was locked. The grooves in all pieces were of uniform depth—0.010 in.—which was accomplished by using the graduated collar on the cross slide.

After grooving, the wire was cut to the required lengths in the hand miller, which was necessary because all pieces had to be of the same length and the ends were required to be square.

Ball-Turning Device For Use on the Lathe

By LEWIS H. WILLIAMS

THE drawing shows details of a tool that was originally designed for use in turning 4-in. balls on the ends of spindles. It has since been used for turning balls on shaft ends, turning half balls, where there were several to be made, and for turning round head press joint screws. The tool holder is adjustable, and can be used to turn any size of ball up to the capacity of the tool. Figure 1 shows the device set up for operation. It can be mounted on either the front or rear of the lathe carriage, as the work may require.

The device consists of an angle plate **A**, on which is mounted a pivot plate **B**, carrying a toolbit holder **C**. The pivot plate is pivoted to the angle

plate by means of the shoulder bolt **F**. When mounted the pivot plate is connected to the tool slide by means of a crank **D**, connected at one end to the pivot plate and at the other end to the block **E**, which is bolted to the side of the cross slide. All parts should be assembled, with the toolbit in place, before mounting. The angle plate is then clamped to the lathe carriage, the point of the toolbit is located exactly at center, and the plate is leveled with the aid of a surface gage. The plate is then doweled and bolted in place on the side of the carriage. The holes

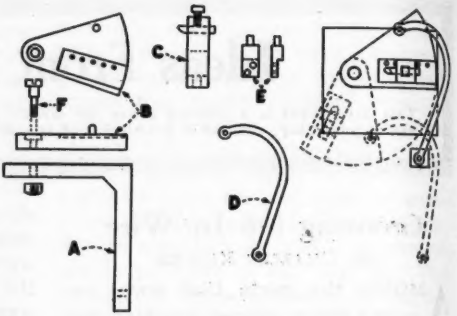


Fig. 2—Details of ball-turning device.

in the connecting rod slip over headless pins, thus making it possible to use the lathe with the regular tool post without dismantling the ball-turning device.

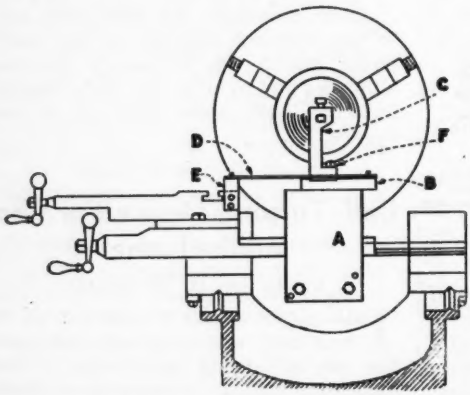


Fig. 1—Drawing showing application of ball-turning device to engine lathe.

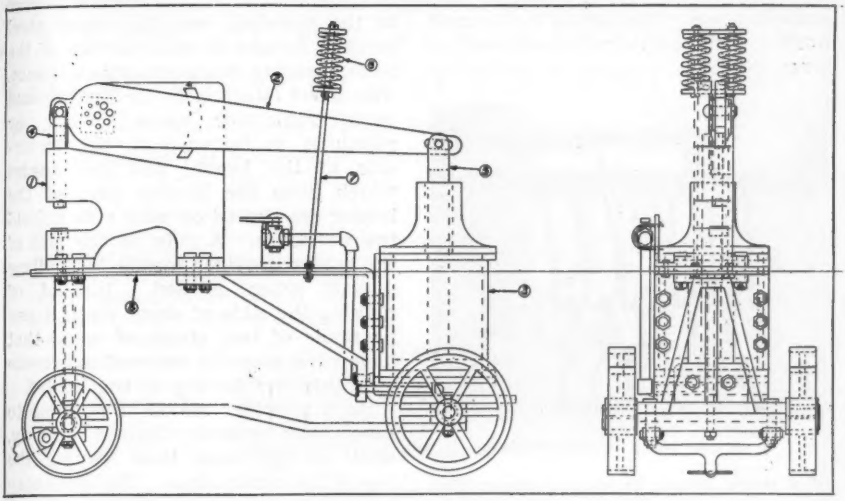
I have found that the simplest way to set the tool for the radius to be cut is to turn a piece to the diameter of the ball, set the pivot plate at right angles to the work, and then push the toolbit up until it touches the work. The toolbit is locked in position by means of setscrews. With the crank **D** connecting the pivot plate to the tool slide, the cross feed nut may be engaged and the cross feed used to operate the tool. By drilling several holes for the capscrews by which the toolholder is anchored to the pivot plate, the toolholder may be moved to obtain a wide range of adjustment.

Portable Pneumatic Punch and Shear For Railway Shop Use

By H. H. HENSON

THE drawing shows the design of a handy and efficient portable punch and shear for use in the engine house and boiler shop. The machine can be built at a nominal cost and the dimensions can be changed so as to produce a machine to suit conditions. A machine that is to be used only in the engine house should be made somewhat smaller than one that is intended for the boiler shop. It will be found worth its cost for cutting off small rivets and bolts and for punching small pieces of iron, and when made to large dimensions, can be used to cut off bolts up to ½ in. diameter.

The machine consists primarily of



Drawing of Portable Pneumatic Punch and Shear.

a machine body (1), coupled by means of a fulcrum lever (2) to a 10x12-in. Westinghouse air brake cylinder (3), mounted on a frame that is supported on four wheels and moved about by means of a tongue. The body (1) is 4¼ in. thick through the heavy part, which is 13 in. high at the front end. The total height of the body is 23⅝ in., the upper 10⅝ in. of which is 2 in. thick. The square recess is machined in the body to take a die-steel plate in which are nine holes of varying sizes. Corresponding holes in the fulcrum lever (2) make it possible to vary the length of the stroke, using lever pins 3¼ in. long and threaded to take a nut. The fulcrum lever is 49 in. long, with a 2-in. slot in front end and a 3-in. slot in the rear end to allow the necessary play for the pins in the upper ends of the ram (4) and the piston rod (5). Recoil springs (6) are mounted on two rods (7) that are anchored to the bed plate (8). Each spring is of ¼-in. spring wire, wound into a coil 6 in. long by 3 in. diameter. The rods are ½ in. diameter and 36 in. long, and the bed plate is of ¾-in. boiler plate. The bed plate is braced by a brace of 1-in. iron.

The wheel rims are 3 in. wide. The front wheels are 12 in. in diameter and the rear wheels are 14 in. in diameter. Holes of 2-in. diameter are bored for the axles, which are each 25 in. long with 4 in. turned down at each end for the wheel hubs. The axles are made of 2 x 4-in. bar iron. The axles are held at the correct center distance by a coupling tongue of 1 x 4-in. stock, 46¼ in. long.

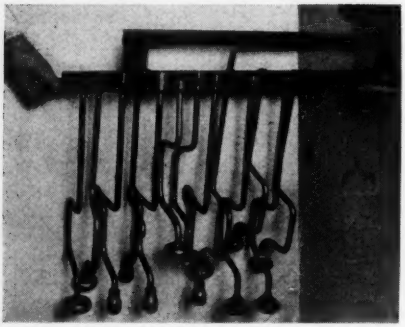
One of these machines is in use in a southern railway shop, where it is considered a very necessary piece of equipment.

Bench Wrench Holder

By GILSON WILLETS

MECHANICS working on assembly work where a variety of wrenches are required will find the device shown in the illustration to be worthy of

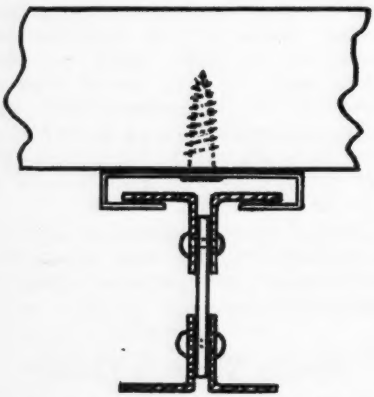
consideration. The device is a wrench holder, designed to hold a number of wrenches, to be hung on the under side



A simple bench wrench holder.

of a work bench in such manner that it can be pulled out while the work is in process and pushed back out of the way when the wrenches are not needed.

The holder is made of four pieces of angle iron, a couple of short pieces of flat plate, and a piece of sheet steel. The angle irons and the sheet steel



End view of wrench holder, showing construction and method of fastening to bench.

should be as long as the width of the bench. The angle irons and short pieces are riveted together as shown in the drawing, and the sheet steel piece is formed to hold the top of the holder, leaving the necessary clearance. The sheet steel slide is drilled and countersunk for wood screws, by which it is fastened to the underside of the bench, and the angles which form the bottom part of the holder are slotted on each side to hold the wrenches. A ring in the end of the holder provides means for pulling it out when needed. Instead of making the slide of sheet steel, it can be made of two strips of wood that have been properly relieved to provide clearance for the top of the holder.

Such a holder makes it possible to reach any wrench desired quickly, while at the same time leaving the top of the bench clear. The slots may be cut to accommodate any size or type of wrench, and wrenches may be arranged in order of size.

An Easily-Made Crane For the Small Shop

By MORRIS A. HALL

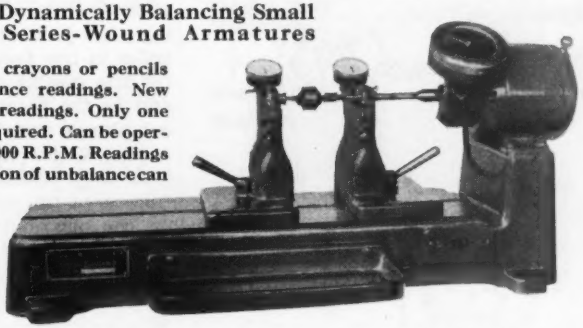
THE small machine shop or the isolated machine tool or bench often has need for a small swinging crane with which to lift medium heavy parts, but seldom is provided with one. The crane shown in the illustration was made from an old automobile front axle, chosen particularly for its straight shape.

The upper surface of the axle was machined off and a trolley was made from two small rollers and two triangular plates, bolted so closely together as to barely clear the sides of the axle, thus making it impossible for the wheels to slip off. One end of the axle was pivoted, by means of two small angles and a "king-pin," to a post, as shown in the illustration. The other end was braced by means of a rod, on the end of which was an eye that could be slipped over a hook

A NEW GLOBE SUPER-SENSITIVE DYNAMIC BALANCING MACHINE

A Super-Sensitive, High Speed Production Machine

Especially For Dynamically Balancing Small High Speed, Series-Wound Armatures

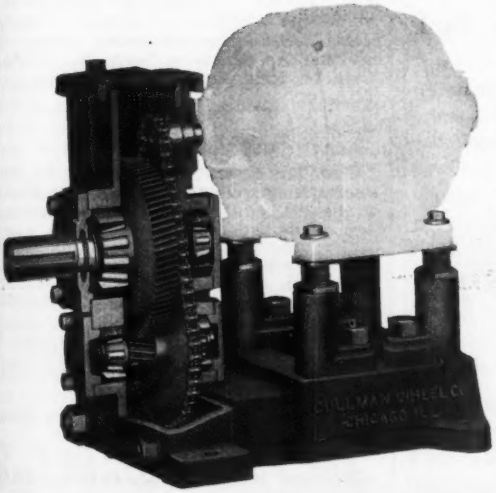


NEW FEATURES: No crayons or pencils for location of unbalance readings. New electrical recording of readings. Only one direction of rotation required. Can be operated at speeds up to 10,000 R.P.M. Readings of magnitude and location of unbalance can be made in 30 seconds. New low prices. Built in sizes for from 1" to 96" in diameter, for weights of from ¾ ounces to 2,000 lbs.

Write our Engineering Department of your particular problem; they will gladly assist you.

The Globe Tool and Engineering Co. 400 DAVIS AVENUE DAYTON, OHIO

The Cullman Speed Reducers

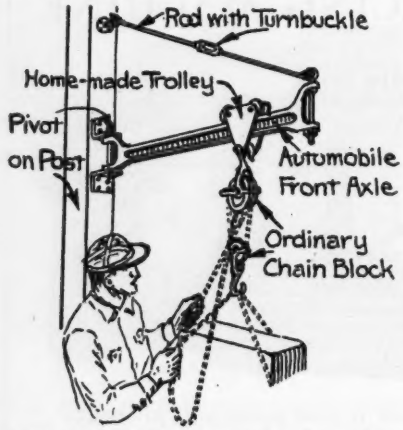


Made in sizes for motors from ⅛ to 15 H.P. Ratio 2.5 to 1 to 1014 to 1. Timken Roller Bearings and Helical Gears. All moving parts operate in a bath of oil.

CULLMAN
Wheel Company
1336 Altgeld Street
Chicago, Illinois

Sprockets - Lathe, Shaper and Milling Machine Drives

on the post above the crane. The rod was cut at the middle and threaded for a turnbuckle with which the correct alignment could be maintained. An ordinary chain block was hooked to the trolley and the crane was ready for use. The maximum working radius is nearly four feet.



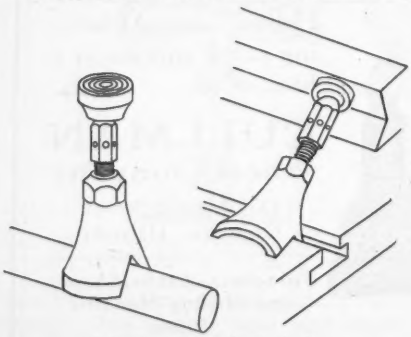
Crane made from front axle of an old automobile.

A Better Toolmaker's Jack

By CHAS. H. WILLEY

I AM including herewith a drawing of a toolmaker's jack that I have found much more useful than the swivel head jack of ordinary design. This jack has a swivel head that is clinched onto the screw head, and the surface bears a number of circular grooves to insure a firm grip. The screw shank is made with a hex to allow the use of a wrench when bracing the jack against work. Three holes in the faces of the hex provide for the use of a pin when desirable, and as the holes are drilled in different planes, the shank is not weakened.

The V-slot in the bottom of the jack-body practically doubles the usefulness of the jack in setting up work on the planer or shaper, and as it is an integral part of the jack, it is always there when needed.



A better toolmaker's jack.

Calendar of Coming Events

Nov. 11-13—American Management Association, Industrial Marketing Conference, at Hotel Statler, Cleveland, Ohio. Headquarters, 20 Vesey St., New York, N. Y.

Nov. 11-13—International Acetylene Association, Thirty-second Annual Convention, at Congress Hotel, Chicago, Ill. Headquarters, 30 East 42nd St., New York, N. Y.

Nov. 30-Dec. 4—American Society Mechanical Engineers, Annual Meeting, at Engineering Societies' Bldg., 29 West 39th St., New York, N. Y. Calvin W. Rice, Sec'y, same address.

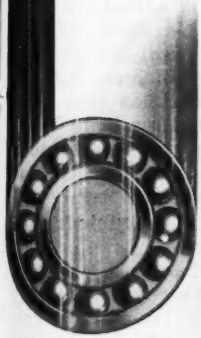
Belt User's Book

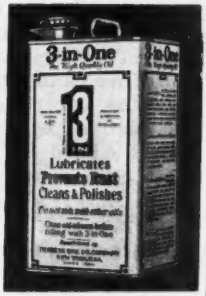
The ninth edition of Rhoads Belt User's Book, which is a careful revision of the 1929 edition, is ready for distribution. The specific suggestions, rules, tables, and charts that have made the previous editions helpful to the belt-user have been retained, and the text matter has been augmented with brief chapters on Short Center Drives and Group and Individual Drives. The book contains 70 pages, enclosed between heavy cardboard covers. A copy will be sent free to any belt-user or plant executive who addresses J. E. Rhoads & Sons, 35 North Sixth Street, Philadelphia, Penna.

Mention MODERN MACHINE SHOP when writing advertisers.

Cool *and* PROTECTED

. . . even at 10,000 r.p.m.





Cheap oils may do well enough on ordinary jobs, but it never pays to trust them for high-speed lubrication. It's always safer to use an oil that is prepared for the purpose.

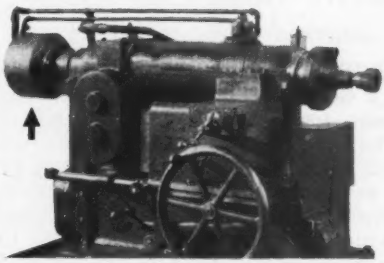
Special blending from *animal, mineral* and *vegetable* oils makes 3-in-One meet every high-speed requirement. As it *lubricates* it *cleans* and *prevents rust*. It flows quickly to friction points and penetrates instantly. It does not gum. And even at speeds of 10,000 r.p.m., it stands up to its job, cooling and protecting bearings.

Available now in gallon cans, from supply houses or direct. Write for circular.

THREE-IN-ONE OIL CO., DEPT. A-143
170 Varick St., New York
260 Second Ave., Ville St. Pierre, Montreal

3-IN-ONE OIL
FOR INDUSTRIAL USERS

"LOGAN"



. . . . . *for Quick Action!*

WHEN it comes to chucking, or holding work in all types of machines . . . **quick action** is the factor which eliminates waste in time, effort and motion.

And, **quick action** is what you get with LOGAN Devices on the job. A single movement of the control valve is all that is necessary to operate drill jigs, vises, arbor presses, milling fixtures, etc. The illustration shows a LOGAN installation for operating a work holding fixture on a special machine. Its **quick action** speeds up production.

LOGAN **quick action** will eliminate waste in time, effort and motion in your shop more effectively than any other method. Let us show you. Write for Catalog S-25.

The Logansport Machine Co.
LOGANSPORT INDIANA

Over the Editor's Desk

Gerard Swope Has Started Something

GERARD Swope, president of the General Electric Company, has come forward with an idea that—whatever form it eventually takes—will undoubtedly be the beginning of a new era in industry. He says, in effect, that the relation of the individual plants in a given industry to each other is similar to the relation of each machine in a factory to the others, and that individual manufacturers should organize so that the activities of all of them could be coordinated for the best interests of the industry as a whole.

In a modern factory the production required from each machine is not left to the operator of that machine; it is controlled according to a schedule which also stipulates the production required from all other units in the plant, so that an even balance of parts can be maintained and production can be adjusted according to the requirements of the market. It would be considered the height of folly for a manufacturer to leave the matter of production to the foremen of the various departments, or to the machine operators. System is necessary—enough system so that the individual functions of the plant will operate together smoothly and harmoniously, like a complete mechanical unit.

In fact, the advantages of system and order in manufacturing have become so apparent, in the last 25 years, that every plant function possible has been systematized, from the methods of keeping the records to the speeds and feeds used on the individual jobs in the shop. Everything has been systematized but industry itself—and there, according to Mr. Swope, lies the reason for the failure of the entire industrial economic system.

It is apparent that we are about due for a change in our industrial set-up. At this moment a large part of our population is starving in the midst of plenty, and for no reason at all that anyone can discover, excepting that we are dominated by fear. Fear for what may or may not happen tomorrow. The man who has money is afraid to buy what he needs for fear he won't be able to make more money with which to continue existence, and the manufacturer is afraid to hire workers and start his plant for fear he won't be able to sell his product. Neither one can be blamed, but our boasted higher civilization is a delusion if we cannot find a way to eliminate the uncertainty of the future and plan so as to avoid such chaos as has existed for the past two years.

Mr. Swope, who is undoubtedly one of the country's best thinkers, is offering a plan. It probably isn't perfect, but it is a plan. There will probably be other plans, and there will certainly be a lot of cutting and trying before one will be produced that will fit the needs. But some changes must be made; some plan must and will be developed, within the next few years, that will make it possible for both the capitalist and the worker to obtain some idea of where they are going, and how. No one can compute the vast amount that has been lost during these last two years due to the virtual stoppage of commerce and industry, but if even a small part of that amount were spent in an effort to prevent such catastrophies, something would be achieved.

Those who are gifted with vision have read the handwriting on the wall. It behooves every industrial leader to either push or pull—either bend his effort toward the support of Mr. Swope's plan or make some definite move that may be considered as a step toward the same objective.

If It's . . . .

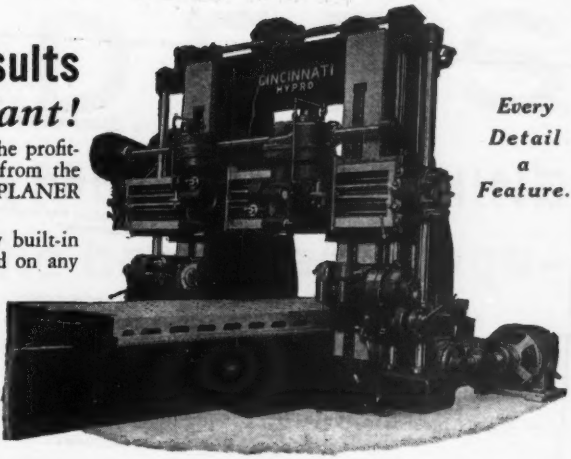
Profitable Results

. . . . You Want!

. . . you should investigate the profitable results you can obtain from the CINCINNATI HYPRO PLANER TYPE MILLER.

You'll find it contains many built-in features which are not found on any other machine . . . features which mean lower costs on every job.

For instance . . . its drive is so designed to deliver an unusually smooth flow of power from the motor to the cutter. Let us show you other features . . . send for a bulletin.



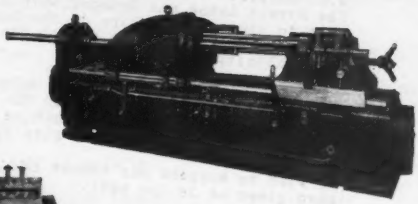
Every Detail a Feature.

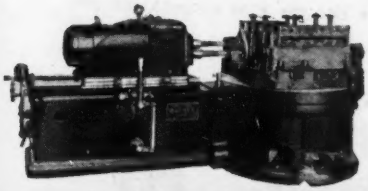
THE CINCINNATI PLANER CO.

3100 SOUTH STREET -:- -:- CINCINNATI, OHIO

STANDARD & SPECIAL DRILLING & BORING MACHINES

Below — Horizontal Boring machine with Rotating Table. A standard type for high production.





Above — Single Head Drilling, Boring and Tapping Machine with screw feed.

W. F. and John Barnes Co.

ROCKFORD, ILLINOIS

Established 1872

THE GLOBE TOOL & ENGINEERING
COMPANY
Manufacturers of . .
THE DAYTON AERO FOUR-IN-LINE

DIE CASTING -:- SPECIAL MACHINERY
DYNAMIC BALANCING EQUIPMENT

DAYTON, OHIO.
October 19, 1931.

Modern Machine Shop,
Cincinnati, Ohio.

Att: Mr. Don G. Gardner.

Gentlemen:

We are enclosing our contract for one year's advertising in your publication "THE MODERN MACHINE SHOP".

You will remember that early last year we announced a new line of Dynamic Balancing machines for rapid and accurate dynamic balancing of miscellaneous production items. Publicity on these new machines was given "THE MODERN MACHINE SHOP" as well as several other larger machinery papers. The inquiries we received from your paper were three to one over all the other papers combined. Included in sales of machines we have made in response to inquiries received from your paper are those from such well known American companies as the A.C. Gilbert Co. - The Fitzgerald Mfg. Co. - The Deming Co. - The Rivett Lathe and Grinder Corp., etc. We have also been able to place our machine in the hands of several excellent machinery dealers in the United States and Europe due to the publicity in your paper.

Enclosed is copy for our first advertisement for the coming year which we wish inserted in the November issue. Included are photos of a new series machine which we are just announcing, and which we wish you would give space in the coming issue.

We wish to express our thanks for the kind cooperation you have given us in the past.

Yours very truly,

THE GLOBE TOOL AND ENGINEERING CO.

H. W. Moore

President.

H.W. Moore:EM
Enc.

ORDERS

Prove that MODERN MACHINE SHOP is the best read Magazine in the field

A YEAR AGO, a description of the new Globe Dynamic Balancing Machine, made by the Globe Tool & Engineering Company, Dayton, Ohio, appeared in the leading magazines in the metal-working field.

Two months later a check-up showed that MODERN MACHINE SHOP had produced three times as many inquiries as all the other magazines combined. Since then, **five** of the MODERN MACHINE SHOP inquiries **have resulted in orders** — and these were the only orders received as a result of all the publicity in all the magazines!

This is conclusive evidence that MODERN MACHINE SHOP is the best read magazine in the field. It is indisputable proof that it is carefully read by the key men of the industry—the men who order or specify new equipment.

Place your sales message where it will be both seen and read—in the magazine that is big enough to carry your message but not too big for convenient handling. And that is

MODERN Machine Shop

128 OPERA PLACE CINCINNATI, OHIO

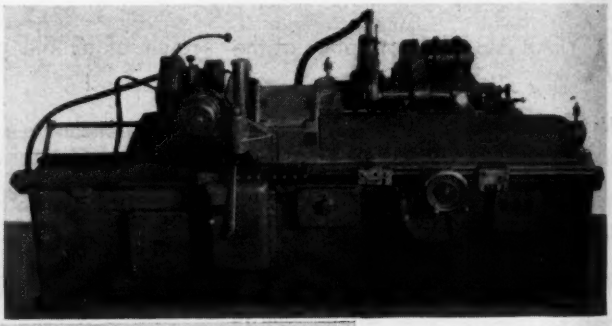
New Shop Equipment

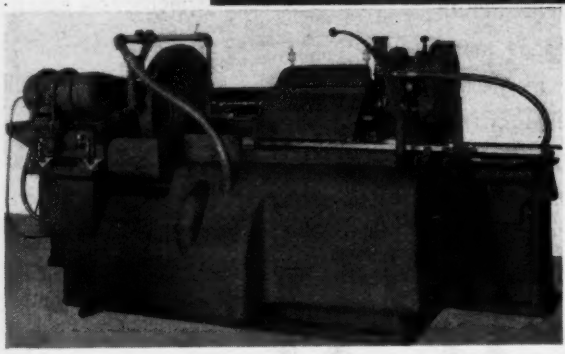
Norton Automatic Cam Grinding Machine

As a result of years of study to meet the demand for a cam grinding machine that would produce faster with no sacrifice of quality, Norton Company now offers the automatic cam grinding machine.

With this machine cam contours are ground essentially in the same manner as with the cam grinding attachments which have until recently been standard equipment for cam grinding throughout the automotive industry. Model cams carefully and accurately made by skilled workmen are used in special machines for generating the master cams, one of which is required for each cam on the shaft. The master cams are assembled on the master cam spindle and ground to the correct angular relationship. In every respect this machine has been designed and built with but one purpose in mind—the rapid and accurate grinding of cam contours. It is not an attachment for a standard machine, but a complete highly specialized tool for a highly specialized industry, and it is offered only where internal combustion motors are built in sufficient quantities to permit continuous operation.

The various functions of cam grinding are performed automatically, most of them hydraulically, accurately, rapidly and without an attendant even touching the machine once the cycle has been started. Because of these automatic features, it is now possible for one operator to run three or four machines, since all that is required of him is to put the cam-shaft in the machine, start the cycle and remove the shaft when the grinding has been completed.





Front and rear view of Norton Automatic Cam Grinding Machine.

After the camshaft has been placed in the machine, the grinding operation is started by pressing an electric push button conveniently located near the operator's position. As the table moves so that the first cam to be ground is opposite the grinding wheel, another clutch is automatically engaged, which starts the grinding cycle. Three cycle speeds are available.

As the wheel slide moves forward to

grind the first cam, the master cam roller is brought in contact with the correct master cam, and a table stop lever is tripped, positioning it for the next indexing of the table. After the first cam is ground the wheel slide moves to its rearmost position, and the master cam and master cam roller are disengaged. Simultaneously the table moves to the second grinding position, the master cam roller to the corresponding master cam, and these functions repeated.

Successive cams along the shaft are ground in the same manner until the last cam is ground and the wheel slide reaches the rear position. The table then moves to the truing position, and a predetermined, but adjustable, truing speed is automatically brought into action. One pass of the diamond is made across the face of the grinding wheel, and as the table carrying the diamond reverses, the work speed is automatically reduced for a finishing speed. A second pass of the diamond across the wheel is made, after which the table continues to move, positioning the work so that the last cam ground is in front of the grinding wheel ready for finish grinding. Each successive cam is then finish ground in a similar manner to the rough grinding operation until the wheel slide reaches its rear position after finishing the last cam. The table then moves to the loading position, the work revolution automatically stops and the clutch is disengaged, stopping the entire cycle.

The operator, who has not been required to touch the machine while all these functions were being performed, now replaces the ground shaft with another and starts the cycle again. If desired, the machine can be used for roughing or finishing only, and in this case the cycle is arranged so that the machine stops when one pass of the table is completed in either direction.

The machine is motor driven, three motors being required for its operation. A 3 or 5 h.p., 1,800 r.p.m., constant speed motor is mounted on the wheel slide and drives the grinding wheel. A 1 h.p., 1,200 r.p.m., constant speed motor is mounted on the table and drives the work, while a third, which is a 5 h.p., 1,200 r.p.m., constant speed motor, is mounted at the rear of the base of the machine and is directly connected to the lubricant pump and also drives the backshaft from which the hydraulic pump and the cycle mechanism obtain their power.

The bases for all lengths of machines are single castings arranged to rest on three points. They are stiffly ribbed with heavy cross sections. The weight is so distributed that vibrations are minimized or entirely absorbed. The table also is a single casting of massive proportions on which are mounted the rocking bar, the diamond tool holder and the bracket which supports the master cam roller and the work drive mechanism. The table is indexed hydraulically from one position to the next by means of a cylinder and piston. Trip dogs carried in a tee slot at the front of the machine correctly position the table for grinding each cam.

The hardened steel master cams are exceptionally wide and made from blanks 6 in. in diameter, thus assuring minimum wear and long life. The master cam spindle is of large diameter and carries an unusually large work center, the point of which is high speed steel. The rocking bar is of cast iron with heavily trussed cross-section supported by three bearings, one at each end and one in the center. A dovetailed section on the upper side provides means for clamping steadyrests and the footstock to the rocking bar.

The roll bracket bridges the rocking bar and is securely fastened to the table. The hardened steel master cam roll is mounted on a large diameter shaft supported at both ends in adjustable precision ball bearings fully protected from water and grit.

The wheel slide unit moves on two vee ways of generous area and lubricated by automatic sight feed oilers. The wheel spindle is of carefully selected heat-treated alloy steel and runs in large bronze boxes tapered on the outside to provide for adjustment. The bearings are flood lubricated by a gear pump driven directly from the spindle itself, and a reciprocating attachment which operates while grinding, but stops automatically for the truing operation, is provided.

Master cams can be furnished for use with grinding wheels from 24 in. to 22 in. diameter or from 22 in. to 20 in. diameter, a feature providing wheel economy where a number of machines are used. In this way a grinding wheel worn to a discard diameter of 22 in. in one machine can be transferred to another and used to 20 in. diameter without the loss of contour accuracy.

Hydraulic feed is provided for moving the wheel rapidly to the grinding position and slowly during the actual grinding, the change from one speed to the other being entirely automatic. For truing, an adjustable mechanical feed is employed which is independent of the

hydraulic feed. This mechanical feed is operated through a large feed screw and adjustable half-nut lapped together and mounted in ball bearings. A graduated hand wheel provides for manual feed when desired.

When grinding, the wheel slide rests against a stop, thus positively duplicating the location of the grinding wheel for each cam. Two stops are provided, one for roughing and one for finishing, a change from one to the other being automatically controlled between the rough and finish grinding operations as one of the functions of the automatic cycle.

All the hydraulic valves are of the balanced type and all cylinders are located in the base so that any leakage of oil will return to the oil reservoir. Wherever possible, all oil pipes are concealed, but are readily accessible.

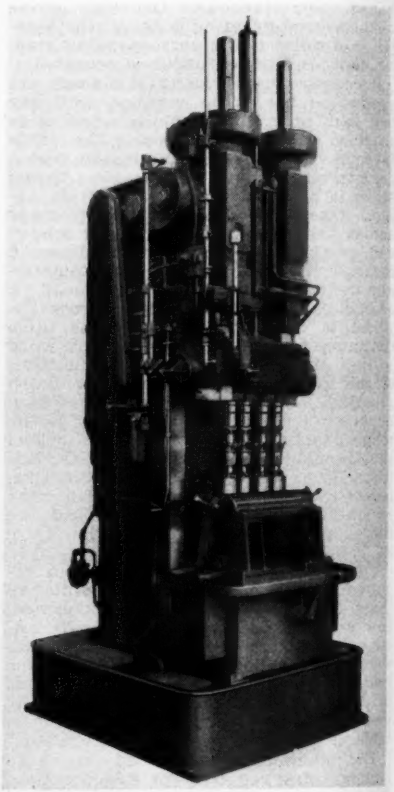
The machine is made in three lengths to take camshafts 36 in., 42 in., and 48 in. between centers. The 36 in. machine weighs approximately 12,000 pounds net, including standard equipment and motors.

Barnes No. 214 Multiple Cylinder Honing Machine

A self-oiling, all-geared, multiple cylinder hydraulically reciprocated honing machine, especially designed for the honing of motor cylinder blocks, has been developed by the Barnes Drill Co., 820 Chestnut Street, Rockford, Ill. When the blocks are reamed within 0.0015 in. to 0.003 in. of size, a production of approximately 100 blocks per hour is obtained, the hone removing all high spots and leaving a perfect bearing surface accurate to 0.0005 in.

The machine is of massive design, which, together with the Oilgear hydraulic system for reciprocating, provides the necessary strength and power to operate as many as eight hones simultaneously. Smoothness and freedom from shock at either end of the stroke is an outstanding accomplishment. The design of the column and base are new, the Oilgear pump being mounted in the column. The filtering system and reservoir for coolant are located in the column and base. The coolant is filtered as it leaves the work and clean coolant is delivered to the work when the head is advanced to honing position. When the head is lifted from the block, the flow of coolant ceases.

The No. 214 machine is geared to one constant speed of rotation, but the cycles of rotation may be changed to suit, while the unit is running, by means of the volumn regulator control on the Oilgear pump. There are two six-splined spindles, driven by hardened steel helical crown gears, which run in two large cylindrical guides that are 5 in. in diameter. On the bottom end of each spindle is attached a multiple head of from two to eight spindles, according to requirements. Each main spindle drives half of the auxiliary spindles. Both the helical gears and the guides are self-oiled.

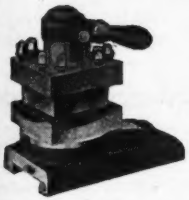


Barnes No. 214 Multiple Cylinder Honing Machine.

A hydraulic cylinder which permits any vertical travel up to 16 in. is mounted between the spindle housings, and a piston is attached to the auxiliary head on the center line of the spindles, midway between them. An air cylinder counter-

STANDARDIZED

LATHE TURRETS



8 Styles

12 Sizes

For any make or size of Lathe, old or new.

STYLE "G"
Square head, for carrying four ordinary lathe tools.

Ask for Circular No. 18

FAY & SCOTT

DEXTER, MAINE

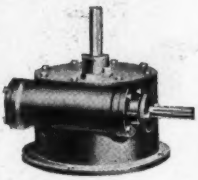
WHS

Stock Shipments of Your Requirements for

SPEED REDUCERS

1/20 to 5 H.P. capacity

Ratios of reduction, 5-1 to 3850-1



Write for No. 26 catalog

Winfield H. Smith, Inc.

30 EATON STREET
SPRIN GVILLE, ERIE CO., NEW YORK

Does Your Equipment **TAKE or MAKE** *Profits?*

Simple, Sturdy, Efficient, Trouble-Proof!

BROWNIE COOLANT PUMP

PUMPS fluid impregnated with emery or lapping compound, etc. Centrifugal in operation. Self-aligning, no packings to leak, no screen to clog. No bottom or pan under impeller to collect grit or chips. Drive shaft, impeller and protector tube are one unit, revolving together. Coolant cannot come in contact with ball bearings which are within 1" of impeller. Two sizes: 60 gallons per minute, with ⅓ H.P. Motor: 20 gallons per minute, with ¼ H.P. Motor; or belt drive can be furnished.

Write for bulletins, prices, discount on any product listed in cut below.

----------COUPON----------

TOMKINS-JOHNSON CO., Jackson, Mich.

Please send information, prices and literature on—

.....

Name.....

Address.....

Tomkins-Johnson
JACKSON MICHIGAN
AIR-OPERATED SCREW MACHINES
COOLANT PUMPS
MILLING CUTTERS
END MILLS
COLLET CHUCKS
AIR-OPERATED CHUCKS
Send For Catalog

balance is used, operating directly on the main air line. Stops on a vertical rotatable rod may be adjusted for any length of reciprocating stroke within the 16 in. of travel and a skip-stop is provided to lift the spindle to uppermost position, thus removing the hones from the work in all cylinders 10 in. in length and shorter. With honing stones 4 in. in length, cylinders 18 in. in length may be honed with an over-run of 1 in. at each end of the cylinder. The maximum stroke is seldom required.

Unitary lever control is provided, the machine clutch lever being so arranged that when pulled forward it engages the driving multiple disc clutch and opens a hydraulic valve, thus simultaneously starting rotation and reciprocation. Backward movement of the lever stops the machine. A latch on the lever permits hand control of the vertical travel of the spindle without engaging the clutch; thus the spindle may be brought to or lifted from the work without rotation.

The machine is equipped with an electrically controlled automatic counting device, which can be set for any predetermined number of strokes. The device is to be used with automatic hones only.

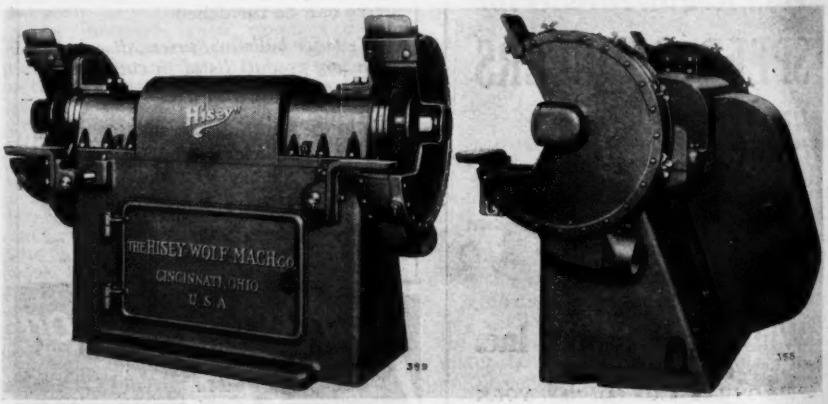
Aluminum fixed-center multiple heads may be used, built interchangeable so that the same machine may be used for honing 4, 6 or 8-cylinder blocks, or adjustable-type heads with 4, 6 or 8 spindles may be supplied if desired. The heads can be changed in a few minutes.

The height of the machine is 11 ft. 11 in. Distance from center of spindle to face of column is 12¼ in. Maximum distance from top of base to nose of spindle, 50¼ in. Minimum distance, 34¼ in. Distance from top of base to floor, 16¾ in. Spindle stroke, 16 in. Diameter of spindle sleeve, 5 in. Diameter of six-splined spindle, driving end, 2 in. Spindle speed, peripheral feet per min., 200 to 250 ft. Reciprocating feet per min., 0 to 60 ft. Floor space, 62½ x 58 in. Net weight, with starter and motor, 10,000 pounds.

"Hisey" H. D. Snagging Grinder

The Hisey Heavy Duty Snagging Grinder which is now being built by The Hisey-Wolf Machine Co., Cincinnati, Ohio, is designed to afford independent speed control for each wheel, thus permitting the operation of both wheels at the most economic and efficient speeds. On previous machines with wheels on both ends of the spindle, the speed of both wheels, for safety reasons, was determined by the speed of the larger wheel, which in many cases caused the smaller wheel to run too slow for efficient service. On the machine shown in the illustration, however, the operation of each wheel is entirely independent.

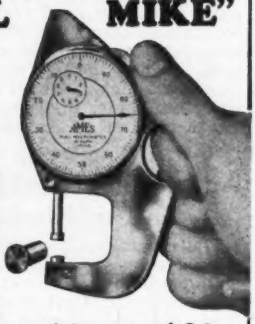
The machine is built for 20, 24, or 30-in. grinding wheels, either high speed or vitrified, with spindle speeds to correspond. Ball bearings or Timken roller bearings are optional. The drive is through V-belts and any stock power motor can be used. Another feature is automatic belt tension adjustment, which eliminates motor adjustment. The spindle is of chrome nickel steel, heat-treated before machining and accurately ground. The wiring is encased in Flex-Steel conduit



"Hisey" Heavy Duty Snagging Grinder with independent wheel speed control.

new—the AMES "DIAL MIKE"

Accurate
Speedy
Handy



A modern dial-reading micrometer that replaces the old style "mikes"—speedier to use—easier to read—extremely accurate.

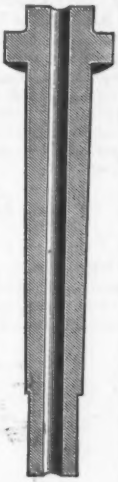
Simply move the thumb to open the anvils. Closes automatically onto part being measured. Spindle lock makes it an adjustable snap gauge if desired.

Capacity, one inch.

PRICE **$12.50** from your dealer or postpaid

B. C. AMES CO.
WALTHAM MASSACHUSETTS
Detroit Office: 902 Stephenson Building

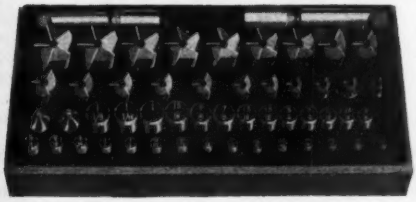
Made By
SPECIALISTS
. . . . *Of Course*
They're Better!



Manufacturers everywhere specify American Hollow Bored Forgings because they are made by specialists . . . men who know real accuracy . . . and priced within reason.

That is why you should investigate American Hollow Bored Shafts and Forgings for your needs. Send us blue prints for data and prices. There's no obligation.

American Hollow Boring Co.
2000 Raspberry Street ERIE, PA.



Gairing Counterbore Sets!

Why waste time making suitable tools in your own plant when Gairing Counterbore and Spotfacing Tools are available in handy sets?

In the manufacture of your product, or in your tool room and machine shop, a set of counterbores is invaluable. They put efficiency, speed and accuracy into your work.

Economical practice demands that you have the right counterbore on hand ready for the job. Looking for misplaced tools is eliminated in a plant equipped with Gairing sets.

Write for information, prices and discounts on these valuable sets, or clip and mail the coupon below for literature.

THE GAIRING TOOL CO., Detroit, Mich.

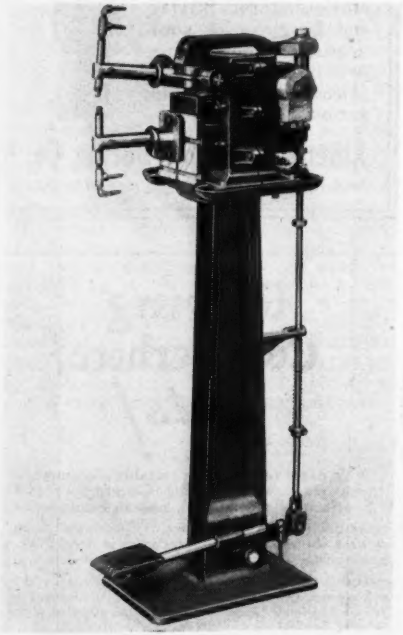
THE GAIRING TOOL CO., Detroit, Mich.
Please send circular, prices and discounts on Gairing Counterbore Sets.
Name.....
Address.....
City and State.....

and fittings, and meets all requirements of the Underwriters.

Steel plate riveted guards with exhaust connections and bayonet-type doors are standard equipment. The steel spark arrester is firmly held in a box-type slide and is easily adjusted to the wear of the wheel. Sturdy steel tool rests provide ample support. They are easily adjusted and can be quickly removed when necessary.

Eisler Electric Speed Spot Welders

The Eisler Electric Corporation, 770 South Thirteenth Street, Newark, N. J., has expanded its line of "Speed" spot welding machines to include machines of



Eisler Electric "Speed" Spot Welding Machine.

½ to 35 k.v.a., with capacities of ½, 1, 3, 5, 10, 20, and 35 k.v.a., capable of handling from 0.0005 in. to ⅝ in. combined thickness of steel. The machines are made for either foot or motor drive.

Simplicity of construction and ease of operation are the features of these machines, the design being such that high speed and uniform welds are obtained with a minimum of expense for operation and maintenance. The machines are built for continuous production, all parts being designed for heavy duty and continuous operation. The machines are intended for use in the welding of aluminum, ascoloy, brass, copper, galvanized iron, lead, nickel, Monel Metal, nichrome, tin plate, zinc, phosphor bronze, nickel silver, and other metals and alloys.

Adaptation of Rockford Automatic Machine

The machine shown in the illustration is an automatic drilling and boring machine, built by the Rockford Drilling Machine Co., 10 Catherine Street, Rockford, Ill., and adapted for drilling, boring, and reaming special bearings. The arrangement is both unique and efficient, considering the operations performed, and the machine increased production so that four lathes were released for other work.

The bearing upon which the operations are performed is made up of two halves which are machined as a single unit. The operation consists of core drilling, turning and facing both ends, boring and reaming the bearing hole, chamfering the ends of the bore, and rough and finish cutting a recess in the bore. The heads at both ends of the machine index simultaneously. There are five working stations, the sixth station being allowed for changing the work. The operations are as follows:

1st Station—Operator replaces finished piece with rough piece.

2nd Station—Core drill and rough turn and face, from both ends.

3rd Station — Semi-finish bore, finish turn and face and chamfer from both ends.

4th Station—Rough cut recess at center of bore.

5th Station—Finish cut recess.

6th Station—Final ream.

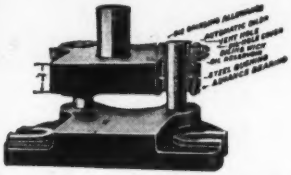
Due to the fact that this machine is to be used on both large and small work, it was built in the heavy duty size to insure ruggedness and elimination of chatter, and to secure the extreme accuracy required.

A motor drives directly into each machine head through duplex worm and worm gear reduction, also through spur pick-off gears with which speed changes are obtained. The clutch is also incorporated in the drive, providing control of spindle rotation independent of motors. All working parts within the drive

BAUMBACH

Automatically Oiled

DIE SETS



Standardized die sets, embodying many exclusive features, and a listing of 70,000 stock sizes afford a service that is unsurpassed.

Your Inquiries Solicited
Send for New 120 Page Catalog

E. A. Baumbach Mfg. Co.
1806 S. Kilbourne Ave. Chicago, Ill.

TWENTIETH CENTURY BALANCING TOOL

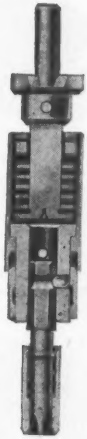
Always on the level

The most practical, sensitive and inexpensive device manufactured for balancing pulleys, cones, armatures, fly wheels, polishing wheels, etc. Will set anywhere and is easily portable. In sizes up to 24,000 pounds capacity.

Ask for the Bulletin

Sundstrand Machine Tool Co.
ROCKFORD, ILL.

Another Apex Winner!



APEX FRICTION CHUCKS

for electric or air tools for nut running; capacity, $\frac{3}{16}$" to $1\frac{1}{8}$" across flats. For stud setting, capacity, $\frac{3}{16}$" to 1". Screw driving, wood screws, No. 4 to No. 24. Lag screws, $\frac{1}{4}$" to $\frac{5}{8}$". Screw drivers furnished with or without finder sleeve.

Apex Friction Chucks are furnished with hex hole in bottom and hex shank to fit chuck of electric or air tool, or with 3-jaw clutch to interchange with positive chuck furnished with electric or air tools having clutch kick-out arrangement.

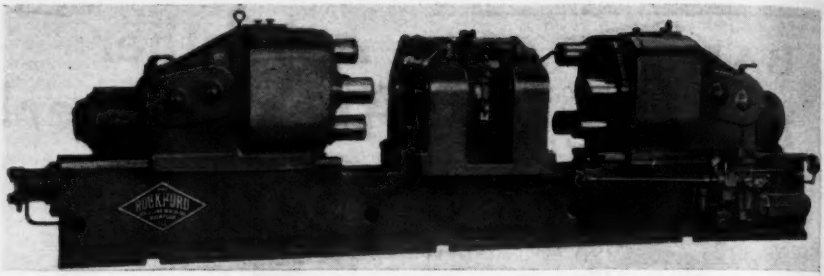
Apex Friction Chucks with this equipment enable you to set nuts, studs, and screws to the desired tightness without any danger of breakage of tools or parts.

Try this Apex equipment—then compare results. You will profit.

SEND FOR CIRCULARS

THE APEX MACHINE & TOOL CO.

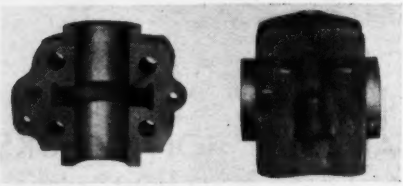
300 DAVIS AVENUE DAYTON, OHIO



Rockford Automatic Machine Adapted for Machining Bearings

are lubricated by oil bath, and Timken roller bearings are used throughout. The result is a powerful, smooth-running drive, operating with the lowest possible amount of electric current.

The spindles in each head are built up



Special Bearing for which Rockford Machine was adapted.

into a separate unit which fits into the front compartment of the machine head, where it is bolted and doweled. The main driver of the spindle head connects with the driver of the machine head. Spindles in this unit are also mounted in Timken tapered roller bearings, and oil bath lubrication is provided. The spindle units are easily changed; so as to adapt the machine for other work within the range of the machine.

Both machine heads, complete with motors, are traversed back and forth simultaneously by hydraulic power. A perfected control makes possible a complete automatic operation cycle after engagement of the control lever. This cycle consists of rapid forward traverse to working position, working feed through the piece, dwell for facing, and rapid traverse to starting position. The table of the machine is in the form of a six-sided indexing drum, mounted in large Timken roller bearings. The drum table can readily be indexed by hand, and locates itself properly at each station. A locating and holding fixture is mounted on each side of the drum table. Hardened and ground steel guide bushings for guiding the cutting tools are incorporated in the table support brackets.

Wittek Universal Die Sawing and Filing Machine

A universal die sawing and filing machine, designed to meet the many and varied requirements in the sawing and filing of dies, punches, templets, gages, or other irregular shapes has been placed on the market by the Wittek Manufac-

Wittek Bench Model Universal Die Sawing and Filing Machine, with motor drive.

Ask any user of

The RHODES "Convertible"

... he'll tell you how it can be used either as a slotter or as a shaper and how accurate, speedy, and economical it is.

He'll tell you that it provides an ideal means of doing a host of jobs usually assigned to much larger machines and how easily it can be changed from one tool to the other, saving space in any shop.

Send for a bulletin.

THE RHODES MFG. CO.
WALTHAM, MASS.

Complete Line of

SELF-OILING ALL-GEARED INTERNAL HONERS

for extremely accurate work at minimum cost described in Honer Catalog U—write for it today.

No. 249—Single Spindle Honing Machine.

BARNES DRILL CO.
801-851 CHESTNUT ST.
ROCKFORD, ILLINOIS, U. S. A.

GUSHER COOLANT PUMP

Model ULO

Less Power - Greater Volume!

Because of their simple construction, "Gusher" Pumps give the greatest efficiency while consuming the minimum of power. This economy is only one of the many advantages of having "Gusher" equipped machines in your plant.

WRITE FOR COMPLETE CATALOG TODAY

THE RUTHMAN MACHINERY CO.
532 EAST FRONT STREET
CINCINNATI, OHIO

turing Co., 4305 West 24th Place, Chicago, Ill. The machine, which is shown in the illustration, has a stroke adjustable from 1¾ in. to 5¼ in., with three possible speed variations of approximately 75, 150, and 300 strokes per minute. The upper arm holder for the saw or file is adjustable vertically to hold files or saws up to 10 in. in length. It will also swing entirely clear of the table when short files are used.

The file and saw holders are universal and can quickly be detached to hold any kind of saw or file. When using short standard filing machine files, the top holder is swung to one side clear of the table and the file is held only with the lower holder. Adjustable hold-downs are provided, which also swing out of the way. Two adjustable roller guides—one above the one under the table—hold and guide the saw for accurate cutting, producing correct and clean finishes. A split collar adjustment is provided for vertical adjustment of the upper holding arm, to tighten the saw or light files to the correct tension.

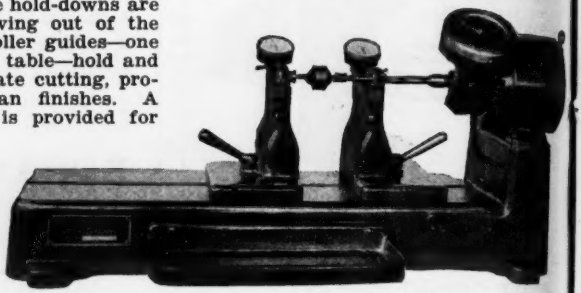
The table is adjustable in any direction for filing or sawing clearances in all positions. It is also adjustable up and down to accommodate thick stock and to allow the use of the maximum stroke. The screw feed is adjustable to any point on the circumference of the table, or may be removed by taking off one wing nut. The fly-wheel is balanced for smooth running at all speeds of the machine. It also serves as a hand wheel when making adjustments, when inserting saws or files.

The frame casting of the Wittek machine is of Meehanite, which is an alloy having twice the strength of semi-steel. Thus a maximum of strength is combined with a minimum of weight.

The machine is made in four models; a bench model that is belt-driven, with tight and loose pulleys; bench model with motor and speed reducer drive; floor model mounted on a pedestal, with tool rack and equipped with motor and speed reducer drive, and floor model with tight and loose pulleys for belt drive. The motor-driven bench model, which is shown in the illustration, occupies a space 14 x 26 in. Equipment includes a set of wrenches, quick detachable file holders, and heavy extension cord with non-breakable plug.

Globe "Super-Sensitive" Dynamic Balancing Machine

In response to a demand for a super-sensitive dynamic balancing machine that can be depended upon for extreme accuracy as well as rapid production, the Globe Tool & Engineering Co., 400 Davis Avenue, Dayton, Ohio, has announced the machine shown in the illustration. The new machine, which is an addition to the regular line of "Globe" dynamic balancing machines, will be known as the Series "N," due to the fact that a Neon light, which has properties of peculiar advantage for applications of this nature, is used to locate the spot of unbalance at the extremely high speeds which are encountered in small series-wound motor armatures. The Neon light is similar to the light used on regular stroboscopes.



Globe "Super-Sensitive" Dynamic Balancing Machine, balancing a motor armature that weighs ¾ ounce.

The Series "N" machine is especially adapted for use in balancing small series-wound motor armatures such as are used in vacuum cleaners, electric drills, and so on, and is said to be the only dynamic balancing machine available for this class of work. No crayons or pencils are used, the location of unbalance being found electrically by using only one direction of rotation, which saves half the time usually required in taking readings. The amount of unbalance is read automatically at the time the location of unbalance is noted, which helps to reduce the reading time of the state of unbalance. On average small work, the time of making the reading has been reduced to approximately 30 seconds. This reading includes the magnitude of unbalance on both sides of the work, as well as its location.

The Series "N" machine can be fur-

An M-C Gear Product

Specify . . . . .

M-C PINION ROD!

THE next time you need small pinions . . . try cutting them from M-C Pinion Rod! Learn from experience how its unusual end-to-end precision assures you accurate pinions.

Production men everywhere have learned of M-C Pinion Rod . . . and its unusual end-to-end precision. They have found that it guarantees greater accuracy and uniformity of the pinions when cut.

What's the size of your pinions? M-C Pinion Rod comes in all sizes and convenient lengths to meet your needs. Better let us quote prices. You'll save money!

MEISSELBACH-CATUCCI MFG. CO.
70 STANTON ST. NEWARK, N. J.

"OUR OPERATORS prefer to work with STACKBINS"

Mail the Coupon!

THAT'S what a satisfied user of STACKBINS tells us. But, let him tell you in his own words why his operators prefer STACKBINS.

"By using two STACKBINS stacked one on top of the other at drill presses, etc., our operators can save considerable time, space, and lost motion.

"Parts to be worked upon are placed in the top STACKBIN. After the operation is finished, the workman throws the part in the bottom STACKBIN, merely raises his hand to the top bin and picks up a new piece to work upon. The result is an easy working cycle, which means more finished parts at less fatigue to him."

Your workmen, too, will like STACKBINS! Try them! Send the coupon for complete information.

Stackbin Corporation
Pearl and Rice Streets Providence, R. I.

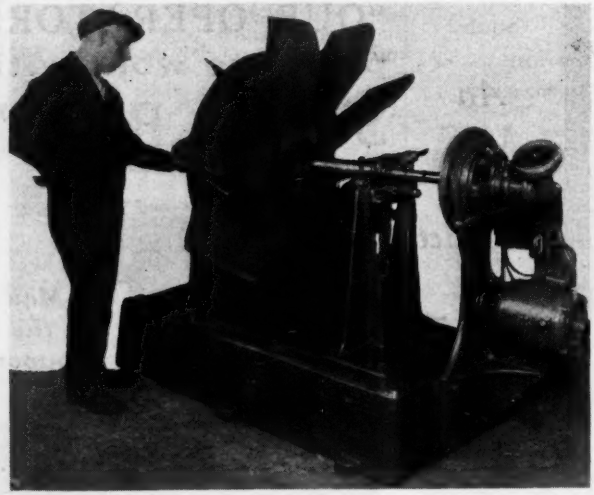
Kindly send descriptive circular and quote prices on STACKBINS.

*Name*_____

*Title*_____

*Firm*_____

*Address*_____

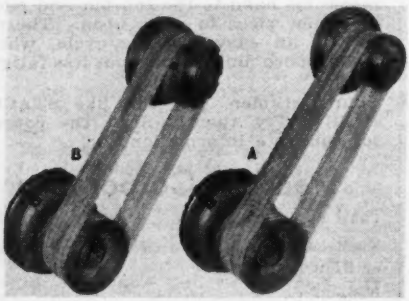


Globe Series "N" Large Size Dynamic Balancing Machine.

nished in sizes to balance work from 1 in. diameter to 96 in. diameter, and will accommodate weights as low as ¾ oz. or up to 2,000 pounds. The machine is also furnished for the special operation of balancing ventilating fans, which has been a difficult operation heretofore.

Hammond Variable Speed Multi-V Drive

Variable speed control through the use of a multi-V drive is now available for use on the grinding, polishing, and buff-



Hammond Variable Speed Drive, using Multi-V belts.

ing machine made by the Hammond Machinery Builders, Kalamazoo, Michigan. It can also be applied to other equipment where 15 h. p. or less is to be transmitted. With this drive the peripheral speed of the grinding wheels may be held constant despite reduction of the wheel diameters by wear. By occasional adjustment of the pulley, for example, a surface speed of approximately 9500 ft. per min. can be maintained on a 24-in. grinding wheel until the diameter has worn down to 13 inches.

Variation of speed is possible within a range limit ratio of 1.33 to 1, or greater if more than one adjustable pulley is employed. Changes in speed are effected by expanding or contracting the diameter of the driven sheave, made possible by the segmental construction of the pulley. These segments engage at their inner ends with a scroll thread, as may be seen in the illustration. At A in the illustration the pulley is shown contracted; in this case a speed of 2800 r.p.m. would be obtained with a 1750 r.p.m. driving motor. With the sheave 75 per cent expanded as shown at B, the speed would be reduced to 2000 r.p.m. with the same driving speed. The maximum recommended speed is 3000 r.p.m.

Geometric "Collapsing Tap" Booklet

The Geometric Tool Company, Valley and Blake Streets, New Haven, Conn., has issued a booklet which describes and illustrates the "Class S" Collapsing Tap made by this firm, together with the various attachments by which it is adapted for use with different kinds of machine tools. This tap can be applied universally to practically any machine and for any internal threading job over 1¼ in. in diameter. It is made to tap holes up to 6 in. diameter, 8 P. This tap can be provided with a reamer, to ream and tap in one operation; with either solid or roller pilot in any size or type required, or it can be supplied as a combination tap to tap two diameters at the same time. A copy of this booklet can be had by addressing the company as above.

Quickly Pays

For Itself - Then Earns

PROFITS

THAT . . . in a few words . . . is what users say about the UNIVERSAL Boston Angle Plate. They'll tell you how it is constantly busy on drill presses, milling machines, grinders, planers, etc. . . . how it saves on the set-up time . . . how these savings pay for the tool in two months' time and then earn profits for you.

Let us show you a few practical applications of this tool . . . they will suggest many more uses in your shop.

Send For a Bulletin

U. S. AUTOMATIC BOX MACH'RY CO.

459 Watertown Street
NEWTONVILLE, BOSTON, MASS.

Do you have little Holes to Grind?

LET *Chicago Mounted Grinding Wheels* help. They go to the bottom of blind holes as well as clear through open holes of any depth.

They grind formed holes as well as straight—and any size from .050" up.

They cut anything. They're always ready, run either way and wear clear to the shank.

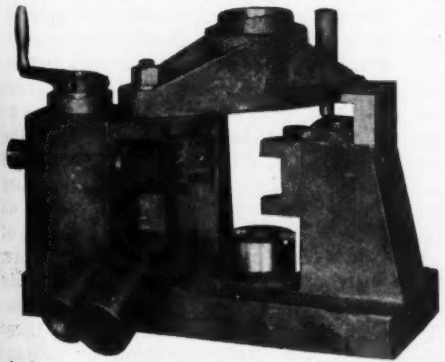
Ask for catalog showing hundreds of sizes, shapes and kinds.

CHICAGO WHEEL & MFG. CO.

110 So. Aberdeen St.
Chicago
14 Smith St.
Detroit

Any doubt in your mind

as to the adaptability of the "QUICK CLAMP" method being applicable to tooling of YOUR PARTS?



Application of Q-C Method to Boring and Tapping Fixture

SEND YOUR PART PRINTS—We will gladly submit sketches and proposal—NO OBLIGATION.

Whether your problem is high production of a few parts or low production of many—the savings are the same.

A standardized Fixture for any part weighing from a few ounces to five hundred pounds.

Your inquiries will receive prompt attention.

A. H. PEARSON — *Exclusive Distributor* — **QUICK CLAMP PRODUCTS**

7 East Grand Avenue, Detroit, Mich.

Inventory System

(*Continued from page 28*)

process, finished parts stock, and finished stock should all be listed separately so that a total may be ascertained for each of these classifications. Where there are different kinds of raw material classifications, each class should be listed separately, also the work in process for each operating department.

In large plants the listing may be simplified and considerable time saved by using tabulating machines which sort, group, and total the information upon perforated tags.

Pricing the Inventory

The pricing of a merchandise inventory is often complicated by market conditions and also by the purposes for which the inventory is to be used. For example, if a complete inventory is taken for the purpose of proving the workings of a cost system, it may be necessary to price the items at values shown by the various cost records. If it is necessary to show a conservative valuation at market or cost, whichever is lower, two pricings may have to be made, one to prove the results of the cost system and another to obtain a statement of financial condition and establish a conservative basis for the opening inventory of the next period.

No inventory valuations made expressly for the purpose of proving a cost system should be carried upon the records. Values must at all times be accurately stated. If prices of material and labor decline, it is essential to consider the effect of this drop on inventory values regardless of any proof of the cost system. Financial statements should be based upon facts as nearly as it is possible to ascertain them. Therefore, inventory valuations must be stated conservatively when financial statements are prepared. It is advisable for a separate set of clerks to check the inventory prices. Failing this, at least some person in authority who has a definite knowledge of the product should review and O. K. the prices, questioning for the purpose of investigation all items which are doubtful.

The information for pricing the raw material items may be obtained from either the raw stock records, purchase department price records, or market quotations, depending upon which is available. If the cost values as shown by the raw material stock records are lower than the market quotations, either the average cost or the last cost may be used for pricing the raw material items. In any event, as already emphasized, the cost values should be stated conservatively and if a cost value is used, it should always be lower than the market value.

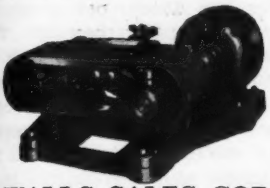
The work in process inventory items are the ones that are most difficult to evaluate when complete costs are lacking. Often these items are priced at the best guess obtained from the estimating cost clerk, sales department, purchase department, or factory foremen. Where a cost system is in operation, the cost records should be used as a basis for valuing the work in process inventory. Under the order method of cost-finding, as all work is done upon some definite order number, work in process items may be connected with the particular cost sheet of that order. All information as to costs would then be obtained from the cost sheets. Where the process method of cost-finding is in use, the prices are obtained from the average costs, as shown by the detailed cost records of the various processes. It is, therefore, important to consider the exact state of all items composing the merchandise inventory, and in entering these items the last operation or process which they have undergone should be stated.

The prices for inventorying the work in process are often based upon

Abolish Expensive Hand Finishing

WITH A

Simplex-M Abrasive Band Grinder



This Grinder accelerates production and cuts costs. Hand emerying or filing operations are antiquated in comparison. The use of this new modern machine assures straight grain finishes with sharp edges.

Details of this and other styles and sizes on request.

WALLS SALES CORP. 96 Warren Street, NEW YORK

YOUR

MARK

WHEN you put your name on your goods you not only advertise your concern but you increase the value of your merchandise.

Perhaps your marking can be done better with roller dies.

The marking will be the best and cost the least if your dies are made by Schwerdtle.

Write today for more information.

THE SCHWERDTLE STAMP CO.
10 CANNON STREET BRIDGEPORT, CONN.

Anderson Improved

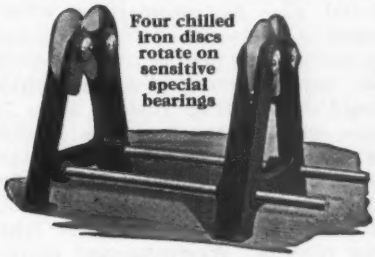
Balancing Ways

No Leveling Required

A simple and excellent device for balancing, straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in Lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

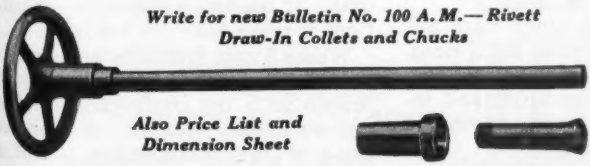


Four chilled iron discs rotate on sensitive special bearings

Write For Full Information

Mfd. By **Anderson Bros. Mfg. Co.**
1926 Kishwaukee Street, Rockford, Ill.

Write for new Bulletin No. 100 A. M.— Rivett Draw-In Collets and Chucks



Also Price List and Dimension Sheet

COLLET ATTACHMENTS for YOUR LATHES and MILLERS

Rivett
LATHE AND GRINDER CORP.
Brighton Dist.
Boston, Mass., U. S. A.

a standard or predetermined cost which may be inaccurate. Where the labor costs are standardized, only fluctuations in the material need be considered. The fluctuations are so important that information as to these costs should be obtained from purchase department records or raw stock records if complete records of prices are kept thereon.

As costs consist of material, labor, and overhead, the valuations placed upon work-in-process inventory items must also consist of these three elements of cost. For example, if a large contract were three-quarters completed, the costs of that job would not consist of material and labor alone. Three-quarters of the overhead also would have accumulated and should be included in the inventory value of the work in process.

The method of pricing the finished parts stock and finished stock items should also be considered. Where complete costs are kept, the prices for these items may be obtained from the various stock records, which would show average costs to date. In some cases where the stock records do not show costs, the information for pricing the finished stock and finished parts stock items would be obtained from the cost sheets or other cost records. Where no cost system is in operation, the costs of finished parts or finished stock are obtained from predetermined or estimating cost records. Too often these items are guesses which cannot be verified and proved with actual facts.

Whenever finished stock and finished parts stock items are priced, consideration must be given to possible fluctuations in material and labor costs, while the overhead should be conservatively computed.

Figuring, Checking and Proving the Inventory

In taking inventory the figuring work consists principally of multiplications and additions, and in calculating quantities and prices care should be exercised not to confuse unit prices with prices per dozen, per gross, or whatever the quantity may be. The various calculating devices, such as adding and multiplying machines, are of great assistance. Also, some concerns are organized for the express purpose of calculating inventories for manufacturers and mercantile businesses. As the taking of an inventory entails much additional work, and as these concerns place a corps of clerks at the disposal of the business which utilizes their services, it is often advisable to engage temporary help of this character so as to eliminate much of the drudgery and overtime that is usually necessary.

Where the pricing and calculating is done directly upon inventory sheets (Form 2 and Form 3), all multiplications and additions should be recalculated. Even this, however, does not insure accuracy, as the same errors may be made by different clerks. Therefore, as a further safeguard, prices and total amounts may also appear upon the inventory tags (Form 4). The comparison of one amount with the other insures accuracy. Another method is to have two clerks price the inventory without seeing each other's figures. To this end two columns are ruled on the inventory sheet. After the first calculations are made, one column is detached and later compared with the second set of figures entered in the second column. If the totals agree, the calculations may be taken as accurate.

Where a cost system is in operation, the merchandise inventory may be proved with the controlling accounts and subsidiary ledgers. As the sections of the merchandise inventory show the total values of raw material, work in process, finished parts stock, and finished stock, these totals may be compared with the respective control-

ling accounts. If the latter, as already explained, are subdivided, a proof may be made with each classification of the material, work in process, finished parts stock and finished stock. In the same way the material, labor, and overhead costs of the work in process may be proved by means of separate controlling accounts.

Atomic Hydrogen Welding

(*Continued from page 36*)

tions where repetition or steady continuance is necessary, such as in the welding of ends to containers, or in the welding of longitudinal pipe seams. The machines used thus far for atomic hydrogen welding are of the latter type—for welding straight seams. The design of the machine includes such features as a clamping mechanism for holding the work, an automatic travel carriage, a welding head with the usual control devices, and other features; in addition there is an auxiliary feeding device for feeding filler rod into the arc, as the tungsten electrodes used to form the arc are consumed slowly and do not contribute metal to the weld.

In operation, the work is clamped in place in the usual manner, the travel carriage is set at one end of the seam, and the "start" push button is depressed. The remainder of the operation is automatic. With the pressing of the "start" button, the line contactor closes, applying power to the equipment and simultaneously opening a valve through which hydrogen is supplied to the arc. The striking of the arc, movement of the travel carriage, and length of the arc are all controlled automatically.

Greenerd

Arbor Presses

Write for our Catalog showing 64 different styles

EDWIN E. BARTLETT CO.
NASHUA, N. H.

Care of Belting

(*Continued from page 40*)

mineral oils which are almost certain to be driven out by the steam. Unless the belt is treated after steam-cleaning, in accordance with the instruction of the manufacturer, the fibers will be left dry and brittle and the belt will fail prematurely.

(Editor's Note: Cleaning agents are now being manufactured which are not only particularly efficacious in the cleaning of leather belting, but are also perfectly safe to use under all conditions. The names of the manufacturers can be had upon request.)

SPEED

SPOT WELDERS

OVER 20,000 IN USE

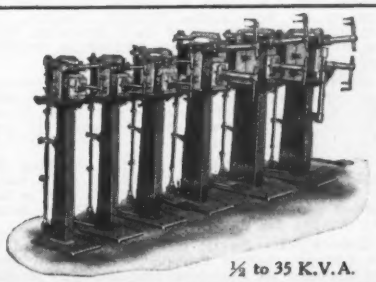
Made foot-operated and automatic motor drive, for welding from .0005" to 5/8" combined thickness.

Welders for fine work priced as low as .... **$55.00** SUBMIT YOUR PROBLEMS

EISLER ELECTRIC

761 South 13th Street, NEWARK, NEW JERSEY

Distributor and Dealer Connections Desired



½ to 35 K.V.A.

For Your Catalog Library

Check any of these useful publications that you want, write your name, firm name, title, and address on the margin, then tear out the page and send to Modern Machine Shop, 128 Opera Place, Cincinnati, Ohio. They will be forwarded to you promptly without cost or obligation. Please restrict your list to not more than ten.

Selecting Grinding Wheels: The important points to be considered in the selection of grinding wheels for cutter grinding, tool grinding, surface grinding, internal grinding, or snagging are outlined in a series of folders that can be had without charge by addressing Abrasive Company, Tacony and Fraley Streets, Philadelphia, Penna.

Ames Gages: Catalog No. 50, issued by the B. C. Ames Company, Waltham, Mass., contains complete descriptions and illustrations of the dial gages, gage heads, upright gages, cylinder gages, dial micrometers, and precision verifiers, special gages and attachments made by this company. Copy free upon request.

Scraping By Power: Bearing surfaces can now be scraped with a power scraper that is quicker and easier than the old-fashioned hand method. The tool is described in a folder that is issued by Anderson Bros. Mfg. Co., 1926 Kishwaukee St., Rockford, Ill. Sent free on request.

Steel Furniture for the Shop: The complete line of steel furniture made by the Angle Steel Stool Co., Plainwell, Michigan, including steel stools and chairs, steel foremen's desks, lockers, tables, tool stands, machine tenders, shop boxes and pans, iron bar racks, trucks, bench legs, and bench drawers, is described and illustrated in Catalog "C," which is issued free to machine shop executives.

Stop Tap Breakage: A booklet that tells how to stop the breakage of taps, reamers, and other tools, by the use of a friction chuck, also how to use the chuck for setting studs or nuts, has been issued by The Apex Machine & Tool Co., 200 Davis Avenue, Dayton, Ohio. Sent free upon request.

Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

Hold Odd-Shaped Pieces Securely: A vise in which odd-shaped work can be held securely without the need of special jaws or fixtures is described in a folder that has been issued by The Avey Drilling Machine Co., P. O. Box 487, Cincinnati, Ohio. Copy free upon request.

Hobs and Milling Cutters: A complete line of milling cutters and hobs for cutting all kinds of gears, splines, sprockets and other forms is described in Catalog G, issued by the Barber-Colman Company, Rockford, Ill. Descriptions and illustrations of the Barber-Colman hobbing machine and hob-sharpening machines are included. Sent free on request.

All-Geared Drilling and Tapping Machines: A catalog describing in detail the various types of all-geared, self-oiling, drilling and tapping machines made by the Barnes Drill Co., 801-851 Chestnut Street, Rockford, Ill., will be sent free upon request.

Modern Drilling Equipment: Circulars describing the various types and sizes of Barnes upright drills, multiple drills and horizontal drilling machines made by this company have been issued by the W. F. & John Barnes Co., Rockford, Ill.

Greenerd Arbor Presses: Catalog No. 36, issued by the Edwin E. Bartlett Co., Nashua, N. H., describes and illustrates all the various types and sizes of arbor presses made by this firm. Copy free upon request.

Automatic Oiled Die Sets: The automatic oiled die sets, die shoes, punch holders, leader pins, bolster plates, bushings, and other standard die parts made by the E. A. Baumbach Manfg. Co., 1806 S. Kilbourn Ave., Chicago, Ill., are described in Catalog No. 5, which has been issued by that company. Sent free upon request.

Boker Keyless Chuck: A chuck that is built of three units, grips like a vise, and needs no key is described in a pamphlet that can be obtained by addressing H. Boker Co., Inc., 103 Duane St., New York, N. Y.

Sheet Metal Problems: The use of the nibbling machine for cutting sheet metal stock is discussed in a booklet which can be had without charge by addressing Andrew C. Campbell, Inc., Bridgeport, Conn.

Mounted Grinding Wheels for use in small holes such as are found in bushings, dies, gears, tools, etc., are described in a catalog that has been issued by the Chicago Wheel & Manfg. Co., 110 S. Aberdeen St., Chicago, Ill. Copy free upon request.

Rapid Traverse Planers: Cincinnati Hypro Planers, made by the Cincinnati Planer Co., Cincinnati, Ohio, are described in a new catalog that has been issued by this company.

Handbook For Drillers: The Cleveland Twist Drill Co., 1242 E. Forty-ninth St., Cleveland, Ohio, has published a book in which the various parts of the twist drill are described, and which tells how to grind a drill correctly. The troubles that result from incorrect grinding are described and illustrated and several chapters are devoted to the subjects of speeds, feeds, materials, cutting compounds, and so on. Sent free upon request.

Motorize Your Cone Pulley Lathes: An attachment that can be applied to your lathe with four bolts makes it possible to motorize and modernize your lathes. Write for information to Cullman Wheel Co., 1336 Altgeld St., Chicago, Ill.

Grinding Wheel Dressers: All of the different types of grinding wheel dressers made by the Desmond-Stephan Mfg. Co., Urbana, Ohio, including Desmond-Huntington, Desmond-Sherman, Zig-Zag, Diamo-Carbo, and diamond dressers, are described and illustrated in a catalog that has been published by the firm mentioned. Free upon request.

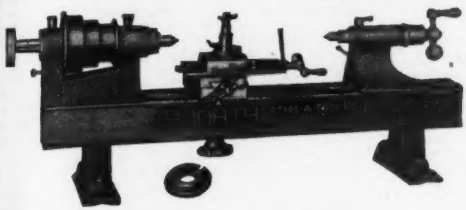
Precision Grinding: A booklet which describes and illustrates the most modern methods of performing all kinds of precision grinding operations, showing how the Dumore grinder can be applied to various kinds of machine tools, has been published by The Dumore Company, Racine, Wis. Copy free upon request.

Interchangeable High Production Tools: Catalog No. 28, issued free by the Eclipse Counterbore Co., 7410 St. Aubin St., Detroit, Mich., describes and illustrates the interchangeable counterbores, spot facers, end form cutters, and other end cutting tools made by this firm.

"Speed" Spot Welders for welding metals from 0.0005 in. to 5/8 in. thick are described in a catalog that can be had by addressing Eisler Electric Corp., 761 South 13th Street, Newark, N. J.

Lathe Turrets of eight different types and twelve sizes are described and illustrated in Circular No. 18, issued by Fay & Scott, Dexter, Maine. Copies free upon request.

Precision Measuring Instruments: The latest types and models of dial indicators, thread lead test gages, pitch gages, thickness gages, dial comparators, and other precision measuring instruments marketed by the



HJORTH

Precision Bench Lathe!

with its many patented features is the ideal bench lathe for factory and tool room. It is accurate for precision work. Send for catalog.

HJORTH LATHE & TOOL CO. 60 STATE ST. BOSTON, MASS.

SHELDON
Arbor Presses

Sheldon Milling Machine Vises, Drill Press Vises, Shaper Vises.

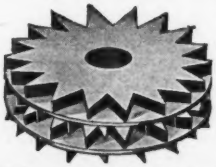
SHELDON 90o ANGLE PLATES

Ask for Illustrated Price List

Sheldon Machine Company
224 S. MICHIGAN AVE., CHICAGO, ILL.

Grinding Wheel Dressers

We make all types of Dressers and Cutters



Write for Catalog "M"

DESMOND-STEPHAN MFG. CO.
URBANA, OHIO

EFFICIENCY—
COMPACTNESS—
ADAPTABILITY—

THREE reasons for the adoption of the PULLMORE Industrial Clutch as standard on a great variety of machinery—machinery built by exacting manufacturers.

We would appreciate an opportunity to supply you with details and make recommendations concerning its application to your product.

Write For Catalog

ROCKFORD DRILLING MACHINE CO.
10 CATHERINE STREET
ROCKFORD ILLINOIS

FEDERAL **DIAL INDICATORS**

Comparators
Amplifying Gauges
Thickness Gauges
Depth Gauges
Thread Lead Gauges
Pitch Diameter Gauges
Cylinder Gauges
Paper Gauges
Fabric Gauges
Rubber Gauges
Tap Comparator Gauges
Gear Tooth Comparators
Cutter Testing Gauges
Internal and External Grinding Gauges

FEDERAL PRODUCTS CORPORATION, Providence, R. I.

WESTERN BRANCHES: 7338 Woodward Ave., Detroit, Mich. 520 Wyson Building, Muncie, Indiana. T. W. Foy & Co., 549 W. Washington Blvd., Chicago, Ill.

New York Office: 50 Church Street, New York City.

Federal Products Corporation, Providence, R. I., are described and illustrated in a book that will be sent free upon application to this firm.

The Involute Gear Simply Explained: A direct, clear explanation of the theory and principles of involute gearing without the use of higher mathematics can be obtained without charge by addressing The Fellows Gear Shaper Co., 78 River St., Springfield, Vt.

Formica Silent Composition Gears: A booklet telling about the uses and advantages of Formica Silent Shock Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears. Sent free by Formica Insulation Co., 4632 Spring Grove Avenue, Cincinnati, Ohio.

Tungsten-Carbide Tipped Tools: The boring tools, counterbores, form cutters, facing heads, reamers, spotfacers, and other tools made by The Gairing Tool Co., 1629 West Lafayette Blvd., Detroit, Mich., made with or without tungsten-carbide tips, are described and illustrated in Catalog No. 20. Copy free upon request.

Balance Your Rotating Parts: Rotating parts weighing from ¾ oz. to 2,000 lbs. can be dynamically balanced on a super-sensitive, high-speed balancing machine made by The Globe Tool & Engineering Co., 400 Davis Avenue, Dayton, Ohio. Write for information.

Ball and Roller Bearings, either journal or thrust, for all purposes and in all sizes, are described and illustrated in catalog No. 9 which has been issued by The Gwilliam Company, 360 Furman Street, Brooklyn, N. Y. Copy free upon request.

Drawing Tables: The Hamilton steel-base, adjustable drawing table is described in Catalog No. 7-MS, issued by the Hamilton Mfg. Co., Two Rivers, Wis. Copy free upon request.

Precision Bench Lathe Work can only be done on finely-built, accurate machines. The complete line of Hjorth Precision Bench Lathes is described and illustrated in a catalog that has been issued by Hjorth Lathe & Tool Company, 24 School Street, Boston, Mass. Copy free upon request.

Useful Tool Information: The Illinois Tool Works, 2503 N. Keeler Ave., Chicago, has published a catalog which describes and illustrates the standard and special cutters, mills, hobs, gear cutters, thread cutters, saws, reamers, and other tools made by this firm. The book also contains a number of useful tables and formulas. Copy free upon request.

Tool Room Equipment: Jig borers, vertical shapers, die relieving lathes, tool milling machines, button die grinding machines, and other tool room equipment are described in a catalog issued by the Index Machinery Corporation, 49 Central Ave., Cincinnati, O. Copy free upon request.

Threading Machinery: Catalog No. 32, containing full descriptions of Landis threading machines, stay bolt threading machines, bolt factory threading machines, automatic forming and threading machines and chaser grinders can be had without charge by addressing Landis Machine Co., Inc., Waynesboro, Penna.

Flexibility in Cylindrical Grinding means increased production, need for less equipment, and lower costs. Send for information as to the advantages of Landis Hydraulic Grinders. Address Landis Tool Co., Waynesboro, Penna.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

M-C Pinion Rod, made by the Meisselbach-Catucci Mfg. Co., 70 Stanton St., Newark, N. J., insures economy and accuracy in cut pinions. Send for information.

Installation and Maintenance of Lathes: A newly compiled booklet showing proper methods of installing, leveling and maintaining Monarch Lathes. It is useful information for every lathe user. Mailed free. Address The Monarch Machine Tool Company, Sidney, Ohio.

Compound Spot-Facing Tool: A spot-facing tool retracting, serrated roughing cutters and fixed finishing cutters in the same tool will break up the scale easily and do accurate work. Write for bulletin to Mummert-Dixon Co., 120 Philadelphia St., Hanover, Penna.

"The Answer to Your Gear Problems": Information as to correct methods of cutting and finishing gears will be supplied without charge by The National Tool Co., Cleveland, Ohio. This firm also carries a complete stock of gear shaper cutters and markets the National-Cleveland Spur and Helical Gear Grinding Machine.

Noiseless Gears: Full details concerning a service for the accurate cutting and finishing of gears, practically eliminating noise, can be had by addressing National Broach & Machine Co., Shoemaker and St. Jean, Detroit, Michigan.

Ball and Roller Bearing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

"Commercial Lapping for Close Limits and High Production" is the title of a booklet that discusses hand and machine lapping, types of lapping tools and machines, workholders for machines, preparation of laps, preparation of work for lapping and other important points. A copy may be had by addressing Norton Company, Worcester, Mass.

"O. K." Tool System: The O. K. System for lathes, planers, shapers, boring mills, and other production machines consists of special forged steel holders with complete sets of tool bits of special design. Particulars can be had by addressing The O. K. Tool Co., Shelton, Conn.

Steel Chairs, Stools, Desks, Lockers, and other steel office and shop furniture are described and illustrated in Catalog M-731, issued by Parent Metal Products Co., Ltd., 338 North Lawrence Street Philadelphia, Penna. Copy free upon request.

"Fastenings" is the title of a booklet, issued by the Parker-Kalon Corporation, 192-196 Varick Street, New York, N. Y., in which are included the results of surveys made in fourteen different plants as to the efficiency of fastening methods. Copy free upon request.

Q-C Standardized Fixture Units in 677 sizes and 5 styles are described and illustrated in the Engineering Book put out by A. H. Pearson, 7 E. Grand Ave., Detroit, Mich. Copy free upon request.

Better Tool Work at Lower Costs can be obtained with the Pratt & Whitney Model B Lathe, described in an illustrated circular which can be had for the asking. Address Pratt & Whitney Co., Hartford, Conn.

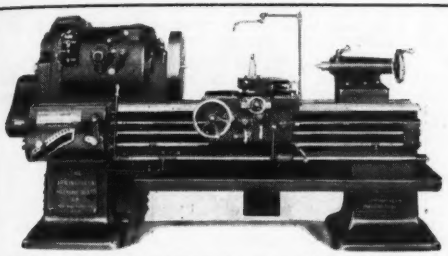
Shape or Slot With This Machine: The Rhodes Convertible Shaper, made by The Rhodes Manfg. Co., Waltham, Mass., can be used for horizontal shaping or vertical slotting. Details upon request.

Bench Lathe Mounting and Driving Equipment: Bulletin 120-A, issued by Rivett Lathe and Grinder Corporation, Brighton, Mass., contains complete descriptions and illustrations of modern and conventional countershaft, individual motor drive jackshafts and speed box motor drive, also benches, cabinets, oil pans, etc. Copy free upon request.

Fullmore Industrial Clutch: A multiple disc clutch, made in two types, to run in oil or dry, and which is so built that it can be operated at high speeds, is illustrated and described in a folder that will be sent free by the Rockford Drilling Machine Company, Rockford, Ill.

Automatic Lubrication: Individually motor-driven pumps that keep the work flooded with lubricant are described in a booklet that has been published by the Ruthman Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

Stamp Your Name on Your Product: Full information as to the steel roller dies made by The Schwerdtle Stamp Co., 10 Cannon Street, Bridgeport, Conn., can be obtained by writing this firm.



A Safe Bet!

When you want a lathe that will increase your production and cut your costs... specify a SPRINGFIELD *Precision* TOOL ROOM LATHE. Past performances prove that it is a Safe Bet!

The Springfield Machine Tool Co., 630 West Southern Ave., Springfield, Ohio

GEARS IN STOCK Immediate Delivery

Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send us your blue prints and inquiries.

Write for Catalog No. 80.

CHICAGO GEAR WORKS

769-763 W. Jackson Blvd., Chicago, Ill.

The Mummert-Dixon Spot Facer

... enables you to machine accurate and smooth surfaces on small bosses, etc., in less time than by any other method. Better investigate! Send for a bulletin.

MUMMERT-DIXON CO. 120 Philadelphia St. HANOVER, PA.

When in BOSTON

The **Kenmore**

GEORGIAN HOTEL COMPANY Proprietors

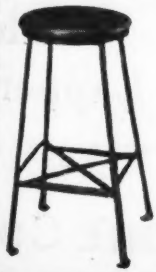
400 Rooms . . .

. . . 400 Baths

Tub — Shower — Shampoo Spray

Coffee Shop and Main Dining Room

PRIVATE PARKING



Steel Stools

PARENT METAL PRODUCTS Philadelphia Penna

Steel Chairs

Tables	Benches	Shelving Units
Desks	Bench Legs	Lockers
Racks	Bench Drawers	Cabinets
Bins	Machine Tenders	Special Equipment

Write For Catalog M-731

Parent Metal Products Co., Ltd.

338 N. Lawrence St. PHILADELPHIA, PENNA.

Push-Broaching With Modern Equipment: Modern methods of finishing holes by push-broaching, are described in a booklet that is issued free by the Sheldon Machine Co., 3255 Cottage Grove Ave., Chicago, Ill.

Simonds Files: A useful book on files showing the various styles made, their uses, cross-section, and cuts, and containing a number of reference tables and other information useful in a machine shop can be had by addressing Advertising Dept., Simonds Saw & Steel Co., 470 Main Street, Fitchburg, Mass.

The Most Efficient Speed for the operation of special production units, power conveyors, and other machinery by the use of the WHS Speed Reducer and how it can be obtained is told in a bulletin that will be mailed free by Winfield H. Smith, Inc., 30 Eaton St., Springville, N. Y.

Speed and Accuracy in Straightening: The Springfield Straightening Press is an ideal tool for use in straightening any length or size of rough or finished work. Send for illustrated folder. Address The Springfield Machine Tool Co., 630 West Southern Avenue., Springfield, Ohio.

Stackbins Save Space: Bins which may be used as individual containers, as tote-boxes, or "nested" to form stock-room sections are described in an illustrated circular published by the Stackbin Corporation, Pearl and Rice Streets, Providence, R. I.

Cutting and Grinding Facts: A discussion of cutting oils and lubricants, together with descriptions and illustrations of various kinds of jobs upon which cutting oils are used, is contained in a booklet that is issued by the Sun Oil Company, 1608 Walnut Street, Philadelphia, Penna. Free upon request.

Rigidmilling Principles and Practice: A book that shows how the Rigidmil can be adapted to various kinds of usual and unusual milling operations, and which describes in detail the work that can be handled by this machine has been issued by the Sundstrand Machine Tool Co., Rockford, Ill. Copy free upon request.

Penetrating Oil for High-Speed Equipment: Three-In-One Oil, blended scientifically from animal, mineral and vegetable oils, will penetrate the tightest bearings and lubricate high speed units perfectly. Full information can be had by writing Three-In-One Oil Co., Dept. 96, 130 William St., New York, N. Y.

Chuck With Air: How time and labor can be saved by the use of air-operated chucks, cylinders, and other equipment is told in a book which describes "Hopkins" Air-Operated Equipment. Published by The Tomkins-Johnson Company, 620 N. Mechanic St., Jackson, Mich. Sent free upon request.

Change drilling speeds instantly without stopping the machine or touching a belt. This can be done with the Victor Super-Drill, made by U. S. Automatic Box Machinery Co., Newtonville, Boston, Mass. Bulletin free upon request.

Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, electric screw drivers, surface grinders, tool post grinders, and bench and floor grinders is described in Catalog No. 29, which has been published by The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio.

Better and Faster Finishing: Finishing and polishing operations can be performed easier, better, and faster with the Simplex-M Abrasive Band Grinder, marketed by Walls Sales Corp., 96 Warren Street, New York, N. Y. Write for illustrated circular.

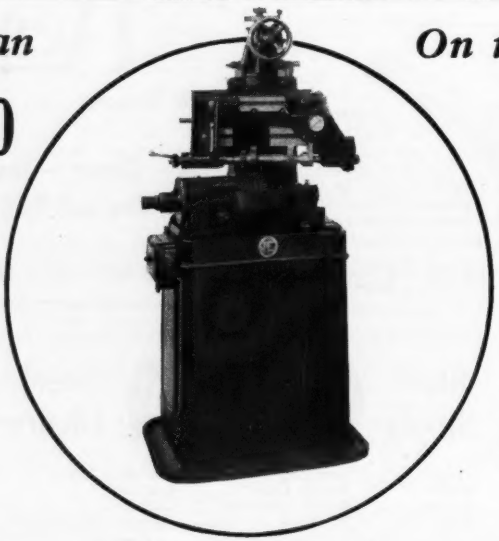
Wappat "Red Streak" H. D. Electric Drills that cannot be stalled by any hand drilling test are fully described and illustrated in a catalog that can be had by addressing Wappat, Incorporated, 7522 Meade Street, Pittsburgh, Penna.

More than

999,990 GEARS

Have Been Lapped

•



On this

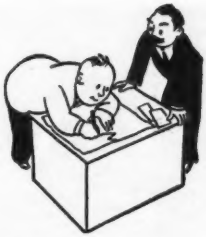
"RED RING"

Gear Tooth Lapper

•

NATIONAL BROACH & MACHINE CO.

SHOEMAKER AND ST. JEAN, DETROIT, MICHIGAN



When a
HOTEL MANAGER
made a road map

THIS guest was leaving in the morning for the South. And he didn't know the road. During the evening, the manager himself made a road map for the guest. Did the guest appreciate it? He wrote back and said he never made a wrong turn.

Perhaps we're wrong in talking about such little things, when United Hotels have such big things to offer. Bigger rooms at lower prices . . . Roomy closets . . . Popular priced cafeteria or coffee shop . . . Central location . . . Even specially selected meats. But somehow, it's the little extra things that bring our guests back. You'll be back, too, once you know us.

Extra service at each of the 25
UNITED HOTELS

UNITED HOTELS

Service

HOTEL FORT SHELBY'S patronage represents a myriad of people who make the Fort Shelby their home whenever they visit Detroit. No finer tribute could be paid any hotel; it is compelling proof of Fort Shelby's ability to render the ultimate in service . . . efficiently and unobtrusively. ¶ Its location in the heart of Detroit's shopping, theatre, financial, insurance and wholesale districts is a happy one . . . 900 units . . . all with servidor, private bath and circulating ice water. Rooms as low as $3.00 per day . . . suites $10.00 and upwards.

Motorists are relieved of their automobiles at the door without service charge. Write for free road map, and your copy of "Aglow with Friendliness," our unique and fascinating magazine.

HOTEL Fort Shelby
E. J. BRADWELL, *Manager*
DETROIT
"AGLOW WITH FRIENDLINESS"

By GEO. ALEXANDER MANN

One o' the best ones handed us lately is that the depression has forced "Two Gun Smith" to change his name —he had to sell one of his guns.

Oh Hush

Now I know Mary,
What a romance,
We sang in the choir,
We met by chants.

Victims of routine wake up in ruts.

A good deal depends upon whether you want to become a squarer man or a rounder.

O' Course

I got a thirst for knowledge
I've had it since a lad,
I get my knowledge from my maw,
An' get my thirst from dad.

To park down town used to be an offense. Now it's a miracle.

Wail O' the Grocer Hound

Too dern many inspectors,
They're 'bout as bad as fleas,
They take sniffings of my meat
An' movies of my cheese.

The main trouble with a finished singer is that he's never finished.

Ev'rybody seems to know it's a buyers' market exceptin' the buyers.

Ain't Ut Turrible?

Whether you ride or walk,
They got you up a stump,
They ain't no place left
To either park or jump.

An' then again maybe gentlemen prefer blonds because o' the light overhead.

Sayin' Ut With Blooms

"While we've no dog violets,"
Said Miss Sadie Bowers,
"We've the next thing to it,
We got 'collie' flowers."

Men who carry night keys don't have to give a rap.

It seems to take more than Fleischmann's Yeast to make men rise to the occasion.

The trouble is, the optimists havta depend upon pessimists for their financing.

You Know 'Em

The saps who go a-huntin'
Would sure be guns,
If they got as many bunnies,
As they do buns.

There'd probably be as many railroad wrecks as automobile crashes if the firemen insisted on sitting on the engineers' laps.